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Northeast-Midwest Report



**Northeast-Midwest Institute
The Center for Regional Policy**



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Waste Not, Want Not

State and Federal Roles in
Source Reduction and Recycling
of Solid Waste

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Executive Summary

Solid-waste management practices now in use are in urgent need of improvement. Depositing wastes in landfills is by far the most common disposal method. Most landfills, however, are running out of capacity rapidly; in five years, over one-half are expected to exhaust their space. Where landfilling continues, costs have skyrocketed, partly because many jurisdictions now must pay for the cost of shipping wastes to other states and in some cases, other countries. Incineration, which many jurisdictions have relied upon as an alternative to landfilling, poses environmental and cost problems of its own. The actual and potential hazards associated with landfills and incinerators are stalling the location of new sites.

Some state and local governments already have launched source reduction and recycling programs in response to growing disposal problems. **Source reduction** involves minimizing the volume or toxicity of materials used in products or reducing the amount of wastes produced during manufacturing. **Recycling** involves the collection and remanufacturing of materials that would otherwise be discarded. Both source reduction and recycling often are included in the more general term "waste reduction."

The recent trend among states to adopt such programs is significant; in the last two years alone, at least 12 states have undertaken major new programs in recycling. These programs include a variety of initiatives such as mandatory separation of wastes and consumer education to encourage source reduction.

Despite the progress of some states in enacting waste-reduction programs, however, federal legislation is still needed to supplement state efforts and target areas in which their programs are ineffective. Specifically, federal initiatives in waste reduction could include the following components.

Federal Initiatives for Market Development

Current market conditions do not provide enough of a return for source reduction and recycling to become solid-waste management methods. Federal initiatives are especially important because state market-development programs lack consistency, are limited by state boundaries, and may not keep pace with inevitable increases in the supply of recyclables. Federal initiatives could include a product-based disposal charge that incorporates disposal fees into product production costs and generates revenue to fund related activities. Improvements to existing federal procurement and economic development programs to enhance demand for recyclables are also needed. Federal standards for fabrication of some products and packaging could spur development of less wasteful products; however, more research would be necessary to determine the applicability of such standards.

Coordinated Research and Technology Transfer

Federal support for research is especially important to encourage cooperation and avoid duplication among existing state-sponsored research programs, provide the resources for new research that states are often unable to provide, and fund projects that states may reject because of their scale or lack of direct benefits to the state. Federal support could include demonstration grants for new waste-reduction technologies, a national clearinghouse on source reduction and recycling, and technical assistance to states in implementing waste-reduction programs for both municipal and industrial wastes.

Minimum Requirements for State Programs

Federal agencies, while not dictating every element of state waste-reduction programs, should insist that all contain some common features. States can play an important role in waste reduction, especially in providing leadership and assistance to local efforts. Some states have made progress, but many others still lack even basic mechanisms. No one formula, however, would be effective in every state. Rather, each state must be encouraged to find a way to meet its own needs. The federal government can help more states to reduce wastes by setting some minimum standards, providing incentives for states to formulate solid waste plans, and requiring them to address waste reduction as part of these plans.

This report is organized into four chapters. Chapter 1 examines the performance of solid-waste management practices and the need for government help to reduce disposal needs. Historically, the states have had an important role in solid waste management; Chapters 2 and 3 review recent state initiatives to support source reduction and recycling. Finally, possible federal initiatives to support state waste-reduction programs are examined in Chapter 4.

1. Review of the Problem and Potential Solutions

The Problem

Responsibility for the disposal of solid waste traditionally has rested with state and local governments. Only limited assistance and guidance was available from the federal government. In recent years, however, the Islip garbage barge and the two-year odyssey of the Philadelphia incinerator ash barge have provided vivid examples of the inability of local jurisdictions to manage the waste generated within their borders. As Figure 1 illustrates, the problem is most severe in the Northeast but is spreading South and West.

Waste generation is on the increase. As Figure 2 shows, total residential wastes increased 30 percent from the 1970 level of 120.5 million tons per year to almost 160 million tons by 1986. Even accounting for population growth, this figure represents a 10-percent increase in wastes generated per person from 1970 to 1986; each individual now generates three to four pounds of trash each day. Another 20- to 22-percent increase is expected by the year 2000. To compound the problem, the fastest growing component of residential wastes is plastic, which more than tripled from 1970 to 1986. Plastic items, which endure for decades, now comprise over 7 percent of the municipal waste stream by weight and a much higher percentage based on volume.¹ These rates do not even include industrial wastes, which are estimated to be over 7.6 billion tons per year.²

Landfills

The growth in the amount of waste is coupled, moreover, to the near exhaustion of landfill capacity. Existing landfills, which handle over 80 percent of municipal wastes, are nearly full. Nationwide, over 3,500 landfills have closed since 1979; only 6,000 landfills remain, 45 percent of which have the capacity to hold less than five years' worth of waste.³ New landfills are increasingly difficult to locate; since 1980, fewer than 2,000 have been constructed.⁴ Some experts predict that these capacity problems will become even more severe as states close down facilities that cannot meet EPA's recently proposed minimum criteria for landfills.

Many local officials blame the lack of new facilities on public opposition--the "not in my backyard" syndrome. This claim oversimplifies the issue. Public opposition to landfills is not a recent phenomenon. Landfills, like prisons and highways, have never been welcome neighbors. In recent years highly publicized events at landfill sites have fueled public debate and made most jurisdictions wary of building new facilities.

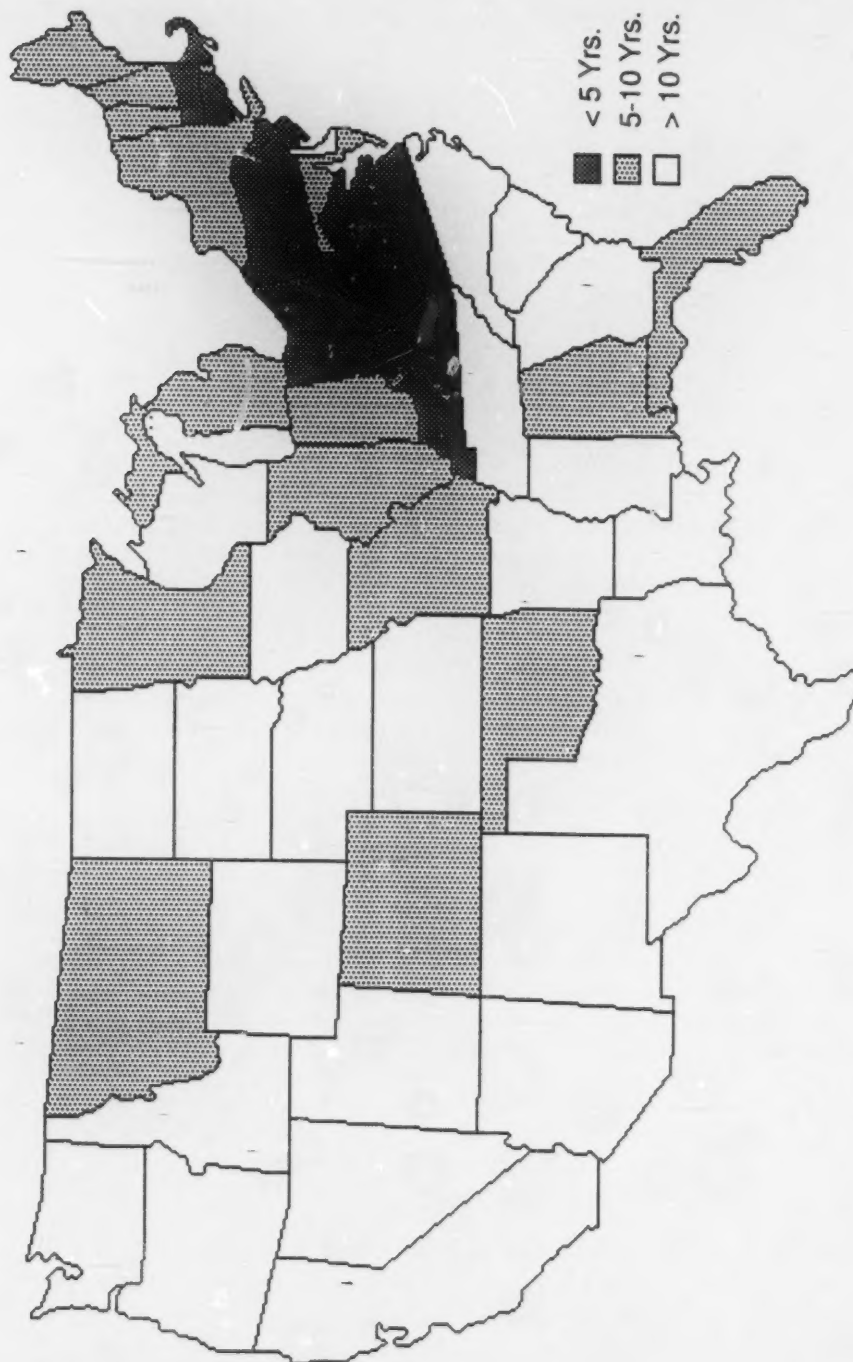
¹Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Characterization Of Municipal Solid Waste in the United States, 1960 to 2000* (Washington, D.C., 1988), p. 6.

²Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Report to Congress, Solid Waste Disposal in the United States, Volume I* (Washington, D.C., 1988), p. 11.

³*Ibid.*, p. 14.

⁴Environmental Protection Agency, Office of Solid Waste and Emergency Response, "Notice of Proposed Rulemaking: Solid Waste Disposal Facility Criteria," *Federal Register* (Washington, D.C., August 30, 1988), p. 23319.

Figure 1
Estimates of Time in Which States Will Reach Landfill Capacity



SOURCE: National Solid Waste Management Association, *Landfill Capacity in the U.S.: How Much Do We Really Need?* (Washington, D.C., October 1988), p. 8.

Figure 2
Total Municipal Solid Waste Discards: 1970-2000

Year	Gross Annual Discards (in million tons)	Per Capita Discards (pounds per day)
1960	87.5	2.65
1965	102.3	2.88
1970	120.5	3.22
1975	125.3	3.18
1980	142.6	3.43
1981	144.8	3.45
1982	142.0	3.35
1983	148.4	3.47
1984	153.6	3.56
1985	152.5	3.49
1986	157.7	3.58
1990 ¹	167.4	3.67
1995 ¹	180.1	3.80
2000 ¹	192.7	3.94

1. Projections.

SOURCE: Environmental Protection Agency, *Characterization of Municipal Solid Waste in the United States, 1960-2000* (Washington, D.C., March 1988), pp. 18 and 19.

Past landfilling practices have caused serious threats to public health and the environment. Reports of explosions and fires caused by methane gas build-up from decaying garbage, and the contamination of groundwater from leaking substances are more and more common. For decades, all types of waste--hazardous and nonhazardous--were dumped directly on the ground or into large pits. While this practice caused minimal damage a century ago, the addition of toxic substances from industries and households has proved disastrous to the underlying groundwater.

As a result of past abuses, at least 184 closed landfills are on the list of the nation's most hazardous waste sites compiled by the U.S. Environmental Protection Agency (EPA). Another 6,000 warrant further investigation for serious contamination.⁵ Cleanup of these sites will cost hundreds of millions of taxpayer dollars. Although new landfill technologies are vastly improved, they are not used universally and do not guarantee against leaks, even with state-of-the-art containment. The stigma that attaches to

⁵*Ibid.*

the communities near these sites and the staggering liabilities and costs associated with treating the contamination has made local officials wary of committing to build new landfills.

For decades, landfills and open dumps were the preferred waste-management options because they were cheap to build and operate. Recently, however, these costs have skyrocketed; disposal costs for some counties in New Jersey increased 800 percent in one year.⁶ Higher prices come in part from the expense of meeting improved environmental controls, but also reflect the rising value of land for the site itself. As development envelopes the suburbs in major metropolitan areas, the large tracts of land needed for landfills simply are not available or are more expensive than jurisdictions can afford. While undeveloped land and existing landfills are available in this country's mid-section, transporting the wastes to these sites also increases the price of disposal. Rising disposal costs, which are typically paid by general property tax revenues, only add to the budgetary woes in many communities. Huge increases such as those suffered in New Jersey can require raising taxes, cutting spending for other programs such as police and fire protection, or both.

Incinerators

The landfill problem has led many local officials to embrace incineration as "the solution" to their problems. The number of operating incinerators is expected to triple in the next few years; EPA estimates that by the mid-1990s incinerators will burn approximately 25 percent of municipal solid wastes, compared with 5 to 6 percent now.⁷ Three types of incinerators, also called resource-recovery or energy-recovery facilities, are common.

- Mass-burn incinerators, which are becoming the most popular, burn large quantities of trash (typically over 500 tons per day) as it is delivered.
- Refuse-derived fuel (RDF) facilities remove recyclables and shred and process the remainder to make a uniform fuel.
- Modular incinerators, which are similar to but smaller than mass-burn units, handle less than 500 tons of trash per day.⁸

Incineration offers many advantages over landfilling. It cuts the volume of wastes that must be disposed as much as 90 percent without requiring any change in garbage-collection practices. Electricity produced by the incinerator has a guaranteed market; the Public Utilities Regulatory Policy Act requires local utilities to purchase the energy that is generated. The revenue from the energy sales helps to offset the operating costs of the facility. In addition, cities are allowed to issue tax-exempt bonds to help pay construction costs of an incinerator, which can run from \$100 to \$500 million.

Incinerators, however, pose environmental problems that have made them as controversial as landfills. Incineration causes air pollution. EPA data indicate that incinerator emissions, which contain dioxins, hydrogen chloride, carbon monoxide, lead, mercury, and other pollutants, may endanger public

⁶Mary Sheil and Aletha Spang, *Recycling in Review: An Update on Eighteen Months of Mandatory Recycling in New Jersey* (Trenton, New Jersey: New Jersey Department of Environmental Protection, 1988), p. 1.

⁷Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Assessment of Municipal Waste Combustor Emissions Under the Clean Air Act* (Advanced Notice of Proposed Rulemaking, Washington, D.C., 1987), pp. 6-11.

⁸Eliot L. Marshall, "America's Big Mess: After You Take Out The Trash, Where Will They Put It?" *Governing*, December 1987, p. 35.

health and welfare.⁹ New technologies have improved combustion efficiency and emission controls on incinerators, effectively reducing toxic pollutants over 90 percent.¹⁰ As the air gets cleaner, however, the ash gets dirtier because removal of toxics from the emissions leaves them in the fly ash (the dust collected in air pollution control devices) in more concentrated amounts. A 1987 EPA study of municipal incinerator ash found that fly ash contained very high levels of lead, cadmium, and other metals.¹¹

Under current law, however, incinerator operators are allowed to mix fly ash and bottom ash (the less toxic ash from the bottom of the furnace) before its shipment to the landfill for disposal. This mixing often drops the overall toxic concentrations below EPA's threshold for hazardous wastes. The ash thus can be handled legally like household trash. However, when the ash is landfilled with other garbage, as is common practice, it mixes with rainwater and is easily washed, or "leached," into the groundwater. Thus toxic compounds in incinerator ash simply leave one environmental media to enter another.

Recently, Congress has considered ways to regulate disposal of incinerator ash to protect public health and the environment. One proposal would designate the ash as a "special waste" and require its placement in specially designed "monofills" that would handle only incinerator ash.— Specific requirements for the monofills, such as the number and type of liners that would be required, are largely unresolved. In the meantime, local officials are caught between needing to dispose of incinerator ash but lacking the capacity to handle it safely. EPA was to issue technical guidance in fall 1988, but has delayed publication pending congressional action. Virtually any method chosen will raise the costs of incineration and ash disposal even higher. Some industry officials claim that stricter ash disposal could boost operating costs at some incinerators as much as a hundredfold.¹²

These factors cast doubt on the ability of incineration to solve the nation's solid waste problem. Some communities have invested millions to construct a facility only to find that revenues are insufficient to cover operating costs or that problems in the technology cause costly downtime and unexpected repairs. While communities continue to invest in incineration, it appears that the rush to burn has begun to slow, but only after tremendous public outcry.

As local officials try to resolve environmental and cost concerns with landfills and incinerators, the lack of new waste-disposal facilities has had a ripple effect nationwide; no region has escaped the mounting problems with trash disposal. States with extra disposal capacity such as Ohio and Pennsylvania are becoming the dumping ground for northeastern states. Many are examining ways to circumvent the 1978 Supreme Court ruling (*Philadelphia v. New Jersey*) that prevents states from restricting the importation of wastes.

Shipment of waste abroad, often to underdeveloped countries, also is a trend among local governments. No statistics on the volumes exported are available because this activity is unregulated. In recent years, however, some efforts to ship both hazardous and nonhazardous wastes abroad have gained notoriety; Philadelphia's attempts to export incinerator ash received wide coverage. This growing practice causes great problems for the countries that receive the wastes, which often lack the resources

⁹Environmental Protection Agency, *Assessment of Municipal Waste Combustor Emissions Under the Clean Air Act*, pp. 13-30.

¹⁰*Ibid.*, p. 15.

¹¹Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Report to Congress: Municipal Waste Combustion Study* (Washington D.C., 1987), as cited in December 3, 1987 press release by Environmental Defense Fund, pp. 1-3.

¹²Bill Richards, "Burning Issue: Energy From Garbage Loses Some Promise as Wave of Future in Waste Disposal," *Wall Street Journal*, June 16, 1988, p. 1.

to handle them properly. These export schemes could threaten the public health and the environment in these countries and damage U.S. interests and its image abroad as well.

Waste Reduction as Part of the Solution

The obvious solution to the problems associated with landfills and incinerators is to find a way to cut the volume and toxicity of wastes that require disposal. Source reduction and recycling are the most accessible means.

Source Reduction refers to efforts to minimize the production of materials that burden disposal systems. It includes methods that lower the volume or toxicity of materials used in products and packaging or that extend the useful life of a product. Reuse of a product constitutes source reduction because it eliminates the necessity of remanufacturing. Successful source reduction means fewer and/or less toxic materials to be recycled, incinerated, or landfilled.

Recycling occurs when materials that would otherwise become wastes are collected, broken down, and remade into either new or similar products. Not all wastes can be recycled; current technologies allow the reuse of glass, newspaper, office paper, corrugated cardboard, aluminum, tin-coated steel cans, tires, batteries, motor oil, and some plastics--mostly polyethylene terephthalate (PET) and high-density polyethylene (HDPE) plastics used in milk jugs and soda bottles.

Composting, which involves using decayed leaves, grass clippings, and other yard debris as soil supplements, can be both source reduction and recycling. When composting occurs at a home (called backyard composting) it is considered source reduction because the material never enters the waste stream. In urban areas, however, where backyard composting is not feasible, central facilities "recycle" the yardwastes for eventual use elsewhere. As yardwastes comprise a large percentage of the waste stream (20 to 40 percent of the weight, depending on the season), any composting can contribute to cutting disposal needs.

Neither source reduction nor recycling are especially "high-tech" or revolutionary but reflect a relatively new, common-sense approach to environmental protection. Rather than trying to control the pollution after it has been created, the source of the problem--the waste itself--is reduced. Cutting the wastes conserves valuable landfill capacity and avoids some landfill and incineration-generated hazards by removing materials from the waste stream that pollute air or leach into groundwater. These processes also avert the problems with some older environmental control methods that simply transferred contaminants from one media to another.

The advantages inherent in source reduction and recycling are not lost on officials responsible for solid-waste management. Many states and EPA endorse a system that ranks preferred waste-management methods as follows: source reduction, recycling, incineration, and landfilling. To ensure that this hierarchy is taken seriously, some states have included it in legislation, thereby making it enforceable. EPA and several states have even assigned a numerical goal to each method. EPA selected 25 percent as a figure for the nation to achieve with recycling and source reduction together by 1992. At present, recycling accounts for less than 10 percent.¹³ Some argue that the two should achieve much more, possibly reducing garbage by 50 to 90 percent. Reaching such levels would require significant changes in manufacturing, consumption, and general solid-waste management.

No one is certain of the full potential of waste-reduction efforts. Few would deny that greater gains are possible. Aggressive direction and support from all levels of government will be needed for source reduction and recycling to become important solid-waste management methods.

¹³Environmental Protection Agency, Office of Solid Waste and Emergency Response, *The Solid Waste Dilemma: Agenda for Action* (Washington, D.C., September 1988), p. 23.

2. Source Reduction--Issues and Actions

Reduction of waste production at the source is widely endorsed as a desirable goal. State legislatures, even county and city councils have discussed various source-reduction proposals. Few, however, have enacted legislation on the issue. Most have held back because they have yet to decide on the best approach or combination of approaches to achieve real progress.

Legislators are confronting the need to deal with two types of nonhazardous wastes--municipal solid waste and industrial waste. Each involves different issues and calls for different solutions. Recent actions by various state governments to encourage source reduction are described below.

Municipal Waste Source Reduction

Municipal solid waste consists of refuse from homes and commercial establishments (restaurants, office buildings and the like). Reduction of these wastes at the source involves cutting the amount of trash that individuals discard, whether at home or work. While jurisdictions may achieve some reductions by encouraging individuals to reuse materials and to compost yardwastes at home, ultimately, municipal waste reduction depends on changes in consumer products and packaging. Desirable changes include extending the useful life of products by making them more durable, repairable, or reusable; using fewer materials in packaging or the products themselves; and removing or reducing materials' toxic components.

Current market conditions do not give manufacturers any incentives to change product design, process techniques, or packaging to minimize post-consumer discards. Manufacturers point out that they are responding to consumer demand in introducing "disposable" products. In many cases these items displace similar products that could be reused or repaired. For example, disposable diapers quickly eclipsed diaper services. The recent introduction of disposable cameras may make reusable, repairable cameras obsolete.

Manufacturers, however, assume responsibility only for the *useful* life, not the full life of a product. Once the product is discarded, disposal becomes the concern of local officials. Even consumers do not pay directly for disposal of used items; municipalities usually pay disposal costs from general tax revenues. Even in communities where households are assessed a separate fee to cover waste collection, the fee is not based on volume. The public seems to have little understanding of how consumption habits affect the amount of waste generated.

The challenge for public officials responsible for the local environment is to discourage the production of wasteful products and packaging--quite a problem for those with little, if any, control over products manufactured for a national market. These officials are attempting, instead, to influence the demand for certain products with campaigns described below.

Consumer Education. Several states and communities have mounted promotional campaigns to educate consumers about the environmental impact of various products. Efforts to inform customers in stores through posters and special events have had mixed results and generally are resource intensive. Rhode Island has begun to work with other northeastern states to develop common labels and logos for certain products to inform consumers about their durability, reusability, and recyclability. However, differences among state definitions of recyclable materials may complicate standardization of labels. In general, education programs require considerable time and resources before consumer demand begins to shift and manufacturers respond by redesigning products or packaging.

Product Restrictions or Bans. Prohibitions on the sale or use of certain items are effective but controversial. So far, only products posing a clear environmental or public health threat have been affected. The most common ban is on the sale or use of food packaging containing chlorofluorocarbons (CFCs) that contribute to ozone depletion. Connecticut and Minnesota also ban the use of the "plastic can" made of PET with an aluminum top and a polyvinyl chloride (PVC) label which is difficult to recycle and may displace easily recyclable aluminum cans. Manufacturers of the can have since withdrawn the product from the market.¹⁴

Suffolk County, New York, banned the use of PVC in food and beverage containers and utensils. PVCs contain chlorine, a suspected source of dioxin in incinerator ash. Many other states and counties have expressed interest in taking similar action. However, the county's authority to enact such a law is facing a court challenge from the American Society of Plastics, a trade association for the industry. The decision in this case undoubtedly will have an impact on future efforts by local and state governments to ban items that pose special disposal problems.

Deposit Programs. The typical deposit program requires manufacturers to accept used items back. When a few states mandated bottle-deposit programs in the 1970s, the effect was to encourage use of refillable bottles. However, with the proliferation of containers of different sizes and shapes, manufacturers no longer reuse bottles, opting instead for recycling that involves crushing and reforming the glass. Current deposit programs are effective in encouraging recycling but not source reduction. Michigan is one of the few states that encourage manufacturers and consumers to use refillable containers; its program allows a lower deposit fee for their use.

Product Standards. Product standards can be established to determine a minimum useful life span for a product or to regulate the amount or type of packaging. State and local governments have shown interest in using standards, rather than bans, to minimize the toxic content of consumer products and packaging. To date, however, the only standards set by legislation involve food containers. A few states have mandated that food wrapping (including grocery bags) be degradable, sometimes specifying a time period, such as 120 days, for decomposition. Congress took a similar approach in 1988 by requiring that six-pack carriers be degradable.

The recent popularity of degradable plastics is in part a response to the growing interest in product standards and restrictions. While use of these new degradable materials may help conserve landfill space and prevent entanglement of marine animals, questions remain about the environmental safety of their residue. Also, degradable plastics do nothing to conserve raw materials, which source reduction and recycling accomplish. Yet most states have been reluctant to enact broader standards for packaging or pass any standards for other items, arguing instead that product standards are a federal responsibility.

Individually these kinds of programs, even if successfully applied at the state and local level, probably will have little, if any, effect on the way products are made. Manufacturers are not likely to change products to meet the requirements of an individual community when their products are produced and marketed nationwide. Cumulatively, however, these initiatives can have an impact. Evidence is mounting that as more communities and states endorse source-reduction measures, some manufacturers are responding. Three companies that are highly visible and therefore vulnerable to consumer preferences recently announced packaging changes. McDonalds has eliminated CFCs from its food containers, and Coca-Cola and Original New York Seltzer have abandoned test-marketing of the plastic can.¹⁵

¹⁴Jeanne Wirka, *Wrapped in Plastics* (Washington, D.C.: Environmental Action, 1988), pp. 105-107.

¹⁵*Ibid.*

Industrial Waste Source Reduction

Industrial wastes include scrap wastes, such as excess trimmings or defective but reusable materials, and process wastes. For the most part, scraps are reused within the manufacturing facility at fairly high rates. By some estimates, reuse of scraps reaches 90 percent.

Process wastes, on the other hand, usually are not reused or recycled within the plant. EPA estimates that over 7.6 billion tons of industrial, nonhazardous process wastes are disposed on plant sites each year. These wastes make up over 67 percent of the total nonhazardous waste stream (see Figure 3).¹⁶ The characteristics of industrial nonhazardous waste vary from industry to industry and even within each industry; an EPA survey of 17 industries revealed that ten industries generate approximately 90 percent of these wastes. Figure 4 describes the ten largest categories of industrial nonhazardous wastes.¹⁷

The costs of disposal of industrial wastes, unlike those for municipal solid waste, are borne by manufacturers or producers as part of their operating costs. In theory, rising disposal costs alone provide a strong incentive for manufacturers to reduce wastes. In practice, however, most are disposed of on the plant site and are not affected by rising municipal landfill or incineration fees. Source reduction of these wastes, then, must focus on encouraging the manufacturer to use more efficient processes or in-plant recovery and reuse. Some states, such as Rhode Island, have begun to charge more for industrial wastes as an incentive for companies to reuse or recycle their discards.

At present, industry does not give reduction of nonhazardous industrial waste much attention or resources. The lack of investment by industry in waste-reduction technologies stems from lack of support by upper management, emphasis on short-term payback on investments, and lack of available technologies and information. Several states have begun to provide information and incentives to companies to reduce wastes. At least 32 states have some kind of program that includes technical assistance, such as workshops on waste audits, information clearinghouses, economic incentives, waste exchanges, and even cash awards. The breadth and number of programs indicates a growing interest among states in industrial waste reduction. To date, however, the primary focus of state waste-reduction programs has been hazardous materials.¹⁸

The lack of emphasis on nonhazardous waste has many causes. For the past eight years, federal and state agencies have devoted resources to dealing with hazardous wastes that often pose more immediate human health and environmental problems. In addition, the 7.6 billion tons of industrial nonhazardous waste that is disposed on plant sites often slips through state regulatory mechanisms. Over 95 percent of these wastes are disposed in surface impoundments (also called pits, ponds, or lagoons) yet only 15 states have any kind of permit requirement for these facilities.¹⁹ The absence of regulation means that states often lack information about the types and quantity of wastes produced.

¹⁶Environmental Protection Agency, *Report to Congress, Solid Waste Disposal in the United States, Volume I*, p. 11.

¹⁷Environmental Protection Agency, *Report to Congress, Solid Waste Disposal in the United States, Volume II*, p. 3-22.

¹⁸National Governors' Association, *State Hazardous Waste Minimization Programs* (Washington, D.C., October 1988), p. i.

¹⁹Environmental Protection Agency, *Report to Congress, Solid Waste Disposal in the United States, Volume II*, pp. D-15 and 3-22.

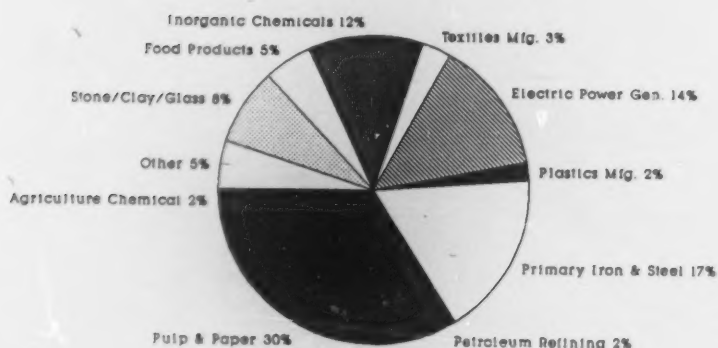
Figure 3
Nonhazardous Waste Categories and Quantities

Waste Category	Annual Generation Rates (million tons)	Percent of Total Waste Stream
Industrial Waste	7,600	67
Oil and Gas drilling waste	129-871	1-8
produced waters	1,966-2,738	17-24
Mining Waste	1,400	12
Municipal Solid Was	158	1.4
household hazardous waste	0.002-0.56	0.00002-0.005
Municipal Incinerator Ash	3.2-8.1	0.03-0.07
Utility Waste		
ash	69	0.61
flue gas waste	16	0.14
Construction and Demolition	31.5	0.28
Municipal Sludge		
wastewater treatment	6.9	0.06
water treatment	3.5	0.03
Very Small Qty. Generator Hazardous Waste (<100kg/mo)	0.2	0.002
Waste Fires	240 million tires	
Infectious Waste	2.1	0.02
Agricultural Waste	unknown	
Total (approximate)	11,387	

SOURCE: Environmental Protection Agency, *Report to Congress, Solid Waste Disposal in the United States, Volume I* (Washington, D.C., October 1988), p. 11.

The concept of source reduction is gaining proponents, and an increasing number of local and state officials are beginning to examine new approaches. In the absence of leadership at the federal level, however, these efforts probably will be limited. Local and state agencies simply do not have the power to influence the aspects of manufacturing and product design needed to lower the production of municipal or industrial solid waste. Federal involvement may be necessary to provide the resources necessary to launch successful source-reduction efforts at the local level.

Figure 4
Ten Largest Categories of
Industrial Nonhazardous Waste



Pulp and Paper -- wastewater sludges, waste paper rejects, wood wastes, chemical recovery wastes, pulp rejects, coal and bark ash

Primary Iron and Steel -- furnace slag and dust, bricks and rubble, sludge, primary mill scale, fly ash and bottom ash, and foundry sand and other wastes

Electric Power Generation -- fly ash (oil and coal), bottom ash and flue gas desulfurization sludge (coal)

Inorganic Chemicals -- salt tailings, red mud, lime particulates, gypsum, sodium ore residues, brine muds, and other wastes

Stone, Clay, Glass, and Concrete -- air pollution control sludge (cement, clay, concrete, gypsum, and plaster), pottery, sludge, and other wastes

Food and Kindred Products -- unusable food, soil and lime mud (sugar products), paunch manure, nonfood waste, liquid whey, soil and trash

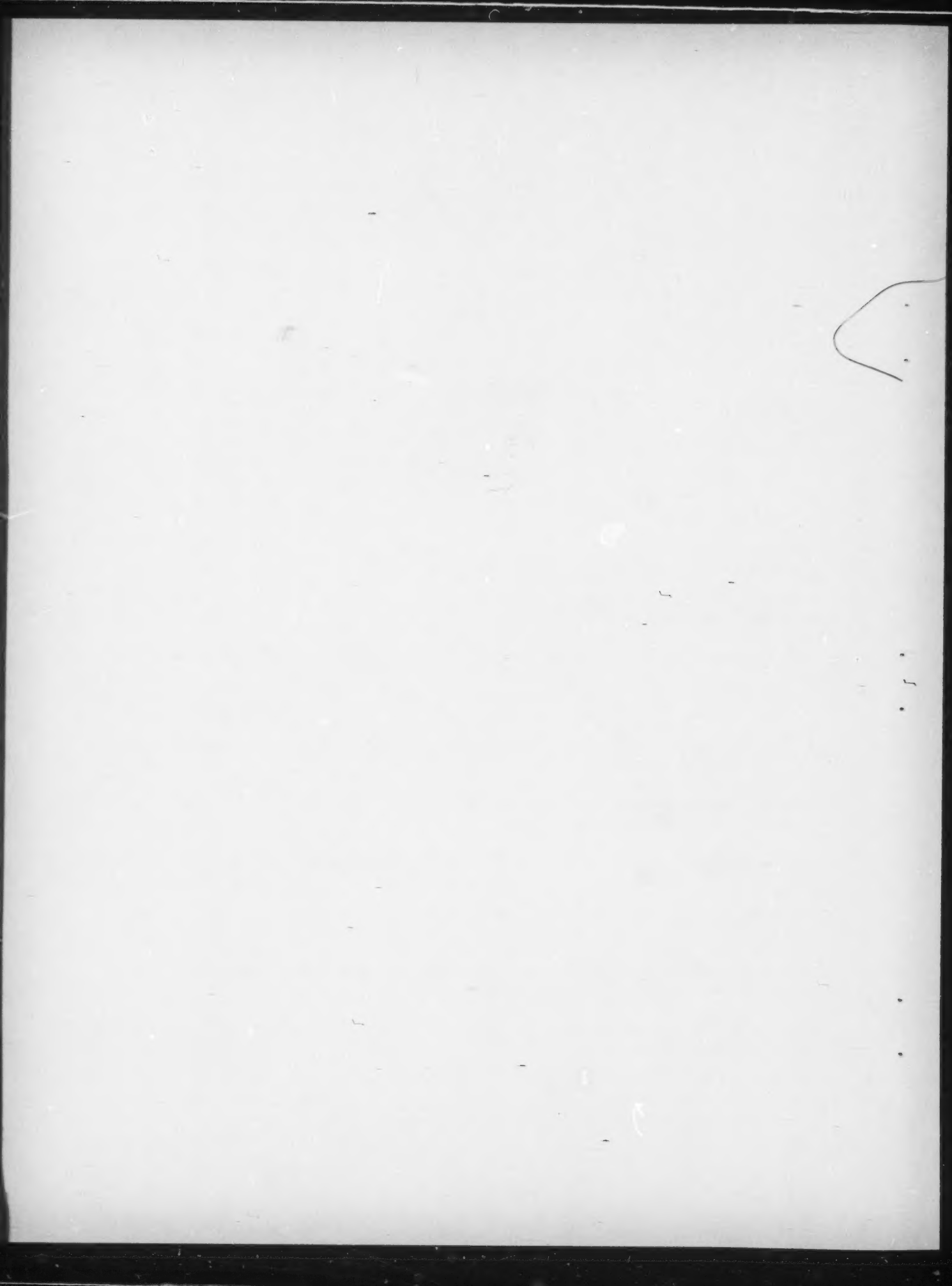
Textile Manufacturing -- wool scouring wastes, clippings, dye containers, dry flick, waste fiber, and wastewater treatment sludge

Plastics and Resins -- process wastewater, decantates filtrates, nonprocess wastewater, spent scrubber water

Petroleum Refining -- biological sludge, FCC catalyst, nonleaded tank bottoms, primary O/S/W separator sludge, Stretford solution, HF alkylation sludge, and other wastes

Fertilizer and Agricultural Chemicals -- waste gypsum, pesticide manufacturing wastes, wet scrubber liquor, cooling water treatment sludge, and other wastes

SOURCE: Environmental Protection Agency, *Report to Congress, Solid Waste Disposal in the United States, Volume I* (Washington, D.C., October 1988), p. 3-22.



3. Recycling--Issues and Actions

The process of recycling generally is easier to understand and measure than source reduction. As a result, many communities with severe waste-disposal capacity problems have instituted recycling programs and ignored source reduction. Nevertheless, recycling is not problem-free; fewer than 10 percent of wastes are recycled partly because of various difficulties.²⁰ These obstacles, plus initiatives by state and local governments to institute recycling programs, are discussed below.

Obstacles to Recycling

Erratic Markets

Erratic markets for recyclable materials have plagued past efforts. Markets are central to recycling. Someone must find a new use for the recyclable material or it will end up at a landfill or incinerator.

The market for recyclables depends on supply and demand. According to many recycling companies, problems with the supply stem from lack of enough high-quality materials. Recyclers, those who convert secondary materials, must have enough high-grade wastes to produce goods of marketable quality. In the past, potential recycling firms believed the supply was inconsistent or not sustainable. Such problems have discouraged them from investing in recycling equipment.

Many local jurisdictions have facilities (typically drop-off or buy-back centers) to accept newspapers, glass, and aluminum. These materials usually are in high demand by manufacturers because they are easy and inexpensive to reuse or recycle. While the drop-off centers are popular and profitable in some areas, the amounts of materials collected vary and are not always of sufficient quality for manufacturers. Adequate separation determines the usefulness of these wastes. In the jargon of recycling, the term *contaminated* is applied to materials that are not adequately separated. Certain manual separation processes and salvage operations to extract recyclables from trash piles may pose health and safety problems for workers. There is considerable research and some progress in mechanical methods to separate recyclables from other trash, although so far these methods are limited to glass and metals.

By far the most common and effective form of separation occurs at the home or business where trash originates. However, even this type of separation, referred to as "source separation," poses problems. Residents or employees may not be sure of what to separate or how to handle the recyclables to ease collection and processing. As mentioned, many towns pay for trash collection and disposal through general property tax revenues; this method produces no economic incentive for residents to separate recyclables from nonrecyclables. In addition, residents can be expected to separate only so much. Japan has one of the highest recycling rates in the world (almost 50 percent of its wastes), but residents must separate their trash into as many as 20 different categories.²¹

The demand side of the market equation is even more problematic than supply and could pose the greater obstacle to recycling. Recyclable material must be used; so far, local recycling programs have found markets for their materials. In the present expansive economy, manufacturing demand for all materials, including recyclables, is strong. But these conditions cannot be expected to last; recyclables,

²⁰J. Winston Porter, "A National Perspective on Municipal Solid Waste Management," Address to the Fourth Annual Conference on Solid Waste Management and Materials Policy, New York, N.Y., January 29, 1988.

²¹*Ibid.*, p. 3.

like any commodity, have experienced swings in supply and demand. A recent decline in the price paid for old newsprint on the East Coast may be a result of excess supply. A price decline may mean that rather than selling recyclable materials, communities must pay to have them recycled.

Rhode Island, for example, pays \$23 per ton to have recyclables processed and marketed. While such a payment may seem high for materials that previously were sold for a profit, it is less than the costs of landfilling or incineration. Even if jurisdictions are willing to pay to have their wastes recycled, as more communities recycle, more outlets will be needed simply to absorb the flood of materials. An economic downturn could further depress markets as manufacturers probably would drop recyclables first to lower production costs.

Trash Handling Practices

As the discussion with trash separation indicated, successful recycling depends in large part on public effort. Many individuals are unwilling to change wasteful habits and politicians are reluctant to force such changes. Politicians are especially resistant to introducing waste-collection practices that require new equipment and personnel. While the investment needed to establish recycling programs is significantly less than for incinerators or landfills, many local governments are unwilling or unable to incur such unplanned costs until faced with a disposal crisis. Although recycling can extend landfill capacity and save disposal costs, jurisdictions with adequate disposal capacity usually are not motivated to pursue recycling or any other costly option.

Technical Problems

Technical problems exist with recycling certain products, especially those containing more than one material such as bimetal cans and plastics. Plastics, which make up more than 7 percent, by weight, of total residential waste, pose one of the biggest challenges to the recycling industry.²² Plastic containers may not be worth collecting, in some cases, because of their high volume-to-weight ratio. Trucks that haul recycled plastics quickly fillup but have only a few hundred pounds of material to recycle. Separation of plastics also is difficult because of the large variety of resin components. While some plastic items are recyclable, primarily those made with polyethylene terephthalate and high-density polyethylene, they can be difficult to sort because the resin content is not visually identifiable.

Several states, towns, and, more recently, the plastics industry have endorsed content labeling to ease the sorting process. Even if collection and separation becomes easier, recycled plastics now are used only in low-demand items, such as fill for sleeping bags and plastic fence posts, which are not themselves recyclable. Some progress has been made in developing and promoting degradable plastics. Although they may lower the need for landfill space as they degrade, they do not conserve raw materials as source reduction or recycling do.

Legal Problems

Finally, local financial commitments to incineration may discourage or actually prevent efforts by local organizations to achieve source reduction and recycling. Incinerators require a minimum tonnage of wastes to run efficiently and generate energy for sale. To obtain adequate bond ratings to finance incinerators, some states have enacted "flow control" laws that make diversion of wastes from an incinerator illegal. Depending on the amount of waste needed by the incinerator, flow-control laws can effectively kill any prospects for aggressive recycling.

²²Environmental Protection Agency, *Characterization of Municipal Solid Waste in the United States*, p. 9.

Recycling Initiatives

After a long and varied history, recycling has gained endorsements as an effective solid-waste management option. Many jurisdictions have begun to develop recycling programs, most of which are designed to separate recyclable materials from other wastes. This process cuts the volume of waste going directly to landfills, at least in the short term. For local officials, success is measured by tonnage of trash separated. This strategy has its problems. Too much emphasis on quantity may cause the quality of the separated materials to decline. There may not be enough markets for large masses of recyclable materials, which most communities do not have the space to store for long periods.

States are stepping in to help local recycling programs and boost market demand. As Figure 5 shows, states are pursuing several kinds of initiatives, such as product deposit/redemption programs, labeling requirements, and tax incentives for recycling businesses. The nature and effectiveness of these initiatives are determined by states' individual economic histories, service and industrial bases, demographic features, and many other factors. Each state has adopted a different combination of initiatives to meet its needs. Those chosen most often are discussed more fully below. They fall into two general categories: program planning and implementation, and market development.

Program Planning and Implementation

State Planning Requirements

Adequate planning is not an innovative or controversial concept. Planning is very important to successful recycling programs, which must be tailored to specific components of the waste stream. Otherwise, a great deal of work could go for naught in targeting a material that was, in fact, a relatively small portion of that jurisdiction's waste stream. Planning officials also must determine the costs and benefits of recycling by examining the impact that it may have on existing markets and other waste-management methods such as incineration and landfills. Neglect of such analysis could lead to costly investments in facilities that are too large or too small or stockpiles of recyclable materials for which there are no markets.

Too often, local jurisdictions do not plan ahead, produce inadequate documents, or ignore plans that already exist. Then they try recycling out of desperation after other options have met resistance, landfills have reached capacity, or their facilities have encountered technical problems. By that time, however, it is too late to do the careful research of local needs and markets for effective, sustainable recycling programs. States can help to lead and direct local governments by encouraging early, careful planning for future disposal needs.

Specifics of state planning requirements vary, but generally include development of a statewide strategy or master plan; requiring local governments to come up with recycling plans either as part of their solid-waste plans or separately; establishing minimum requirements for local plans; and providing technical assistance.

To set the direction for local solid-waste management, some states have set out a comprehensive waste management strategy. Some have established priorities and objectives for an integrated solid-waste management strategy that includes source reduction and recycling and outlines state actions to support it. Typically state agencies get involved with few local waste-management decisions, except for the facility-permitting process. A statewide plan, however, can help to set a general framework and inform local officials about the types of programs the state wants to encourage.

Figure 5
Selected Characteristics of State Recycling Programs

State	Source Separation or Recycling Requirements	Deposit or Redemption Requirements	Disposal Restrictions	Product Restrictions	Labeling Requirements	Educational Promotion	Regional Recycling Facilities	Grants/ Loans	Taxes	Procurement	Research	Other
Arkansas											X	State is sponsoring a recycling feasibility study.
California	X	X			X	X				X		No landfill permit until community has a plan for 20% recycling.
Connecticut	X	X	X	X	X	X	X	X		X	X	Packaging studies required.
Delaware		X										State operates RDF/mechanical separation facility.
Dist. of Columbia	X									X		Source separation to be phased in by 1990.
Florida	X	X	X	X	X	X		X	X	X	X	Advance disposal fee on all containers. Special fees on tires and newspaper.
Hawaii											X	Waste-stream study underway.
Illinois	X				X	X		X		X	X	Disposal surcharge supports Solid Waste Management Fund.
Iowa		X	X	X		X		X		X		Disposal surcharge funds landfill alternative grants.
Maine		X		X						X		12/88 Report to legislature outlines aggressive waste reduction/recycling program.
Maryland	X							X		X		After 1990, no incinerator permits until recycling plans are approved.
Massachusetts	X	X				X	X	X		X	X	State grant for experimental mixed plastics facility.

See Appendix A for further information about state recycling programs.

Figure 5
Selected Characteristics of State Recycling Programs (continued)

State	Source Separation or Recycling Requirements	Deposit or Redemption Requirements	Disposal Restrictions	Product Restrictions	Labeling Requirements	Educational Promotion	Regional Recycling Facilities	Grants/ Loans	Tax Incentives	Procurement	Research	Other
Michigan	X	X				X	X	X	X	X	X	State-sponsoring 10 "model" recycling projects.
Minnesota		X	X	X	X	X	X	X	X	X	X	Counties must address recycling in solid waste plans to receive new disposal facility permits. State has tire recycling program.
Missouri								X				Solid waste plans required for large counties. State seeking to expand recycling clearinghouse role.
Nebraska								X				Tax on consumer items used for grants for anti-litter and recycling projects.
New Hampshire								X		X		Counties required to prepare solid waste plans that address recycling.
New Jersey	X		X			X		X	X	X	X	Recycling Fund supported by disposal surcharge.
New York	X	X				X		X		X	X	Planning units to develop solid waste plans that include waste reduction.
North Carolina									X			State offers technical assistance for waste reduction.
Ohio							X	X	X	X		Counties must develop waste management plans. Disposal surcharge funds program.

See Appendix A for further information about state recycling programs.

Figure 5
Selected Characteristics of State Recycling Program (continued)

State	Source Separation or Recycling Requirements	Deposit of Redemption	Disposal Restrictions	Product Restrictions	Labeling Requirements	Educational/ Promotion	Regional Recycling Facilities	Grants/ Loans	Tax Incentives	Procurement	Research	Other
Oklahoma										X		
Oregon	X	X				X			X	X		State has lower freight rates for recyclables.
Pennsylvania	X	X	X			X		X	X	X	X	Recycling program funded by disposal surcharge.
Rhode Island	X	X		X		X	X	X		X	X	Deposit on batteries. Commercial sector must source-separate wastes as of 1/89.
Texas										X		Local solid waste plans must include recycling, but plans are not required.
Vermont		X				X		X		X	X	Solid Waste Fund funded by franchise tax on landfill owners.
Virginia												Local governments allowed to mandate source separation.
Washington						X		X		X	X	State to complete a study of best waste management practices for entire waste stream. A tire tax funds tire recycling program.
West Virginia											X	Disposal surcharge used to fund recycling study and general waste management activities.
Wisconsin	X		X							X		Cities and landfill owners must provide for drop-off centers.

See Appendix A for further information about state recycling programs.

Some states are making planning a more important part of communities' responsibilities by tying approval of their updated solid-waste plans to permit approval for new facilities or grant awards. Pennsylvania and Florida threaten to withhold all or a portion of state funds from municipalities or counties that do not prepare plans in compliance with state requirements. To ensure that local plans adequately address recycling, Rhode Island actually pays the costs of developing recycling plans for specific towns. Some states have gone so far as to mandate that local governments research and plan for specific aspects of recycling. New Jersey, for example, requires that county recycling plans identify how recyclables are to be processed and marketed.

Beyond simply requiring plans, states can direct that they address certain local conditions and needs as well as state objectives. Some states sponsor pilot projects and provide technical assistance in the form of research and information on recycling approaches--what works, what motivates public participation, what kinds of markets are available. This help can answer questions and overcome skepticism, especially in communities where little or no recycling has occurred. Michigan, for example, has done a series of studies to determine the composition of wastes and feasibility of recycling and composting them in various areas of the state.

Sponsor Regional Facilities

Recycling is not feasible in many small communities because not enough material is recovered to sell. To assist these communities, states have sponsored regional facilities that process and sell recyclables from various sources.

The most common regional facilities are material recovery facilities (MRF) or intermediate processing centers (IPC) that help to make recyclable materials more marketable. Recyclables, often mixed or "commingled," are brought to the facility from several different locations, where they are manually and mechanically sorted, cleaned, and "processed"--glass is crushed, paper is shredded or baled. Because final separation of materials is done at the facility, residents separate their trash into fewer categories, thus making recycling more convenient. In addition to processing large quantities of scrap materials, these facilities improve the quality of the scraps, making them easier to sell to manufacturers.

State waste-management agencies are encouraging strategic siting of MRFs or IPCs either by subsidizing their construction or actually building the facilities and leasing them to private contractors to operate. Massachusetts is building an MRF in Springfield, a city in a western county, and another in the southeast part of the state. Massachusetts and Connecticut have organized "waste districts" composed of one or more counties and plan to fund a large portion of the costs of an IPC in every district.

Improve Source Separation

Programs that require or promote separation of recyclable materials at the source occur most often at the city or county level. Connecticut, Florida, Maryland, New Jersey, Pennsylvania, and Rhode Island, however, have recently enacted statewide mandatory source-separation programs. Many of these programs have not yet been implemented or are in the very early stages of operation. Oregon requires that counties make recycling convenient by providing curbside collection of recyclables, although residents are not required to separate their trash. Several states ban landfilling of yardwastes, which constitute as much as 20 percent of residential totals, and require separate collection and composting of these wastes.²³

Generally, incentives for residents to separate wastes are implemented at the local level. Some jurisdictions are experimenting with programs such as cash prizes for a household randomly selected that

²³*Ibid.*, p. 10.

has separated recyclables from other trash properly. Others lower trash-collection rates for homes that separate, while some do not collect regular trash if recyclables are not also set out.

- States incentives to local programs include grants to help offset the cost of recycling operations. New Jersey pays municipalities and counties for each ton recycled through its Tonnage Grant Program; Pennsylvania has a similar program. In both cases, the grants are funded by a small landfill surcharge (\$1 to \$2 per ton disposed) that the state collects. Statewide deposit programs also offer consumers an incentive to separate certain types of recyclables, such as bottles and cans. Deposit programs are very effective overall in recovering materials. Many of the "bottle bills" result in as much as 80-percent recovery.²⁴ Deposit programs are especially effective for materials with relatively short useful lives that would not be returned routinely without incentives.

Financial Assistance for Program Start-Up

Although recycling offers long-term savings, the initial costs can add 20 to 25 percent to the costs of managing solid-waste programs. These added costs include new collection equipment (compartmentalized trucks, special containers), processing facilities, additional staff, training, public education, and publicity. Municipal budgets often are strained, however, and many towns simply are unable to find enough start-up money. When states impose these programs, as Connecticut, New Jersey, Pennsylvania, and Rhode Island did recently, local governments usually demand some financial assistance.

States have responded in several ways. Some offer local governments one-time grants to help with the initial hurdles of recycling. Rhode Island, for example, offers grants that cover all reasonable costs for the first three years of any local recycling program. For communities with already successful programs, states have offered to fund part of the cost of rapid expansions in their programs. New Jersey chose this approach. In Oregon and Michigan, where recycling was phased in, communities were better able to absorb the initial costs.

Assistance to Public Education Programs

Public participation is critical to recycling; every state with recycling legislation has provisions for public education to promote it. Promotional campaigns such as New Jersey's "Sort It Out Before You Set It Out" are carried out statewide. New Jersey and Oregon consider promotional efforts as primary, on-going state responsibilities. Many states have targeted their education efforts at grade school and high school students. Michigan, New Jersey, Oregon, and Rhode Island have developed recycling curricula for public and private schools. Some states also have endorsed proposals to encourage product labeling to inform consumers about whether a product is recyclable.

Market Development

Statewide Redemption Programs

As mentioned previously, one of the biggest obstacles to source reduction and recycling is that manufacturers are not held responsible for the disposal costs of their products and do not take reuse or recycling into account when designing products or packaging. Deposit schemes are the most common and most effective method of ensuring that items are returned to manufacturers who then reuse, recycle, or discard the used item. The usual approach is for the manufacturer to charge the retailer a deposit, which is also charged to the consumer. To get the deposit back, the consumer must return the item to the retailer who in turn returns it to the manufacturer. The manufacturer reimburses the retailer for the deposit plus a small handling fee.

²⁴New York State Department of Environmental Conservation, *New York State Solid Waste Plan* (Albany, N.Y., March 1987), as cited in EDF *Coming Full Circle*, p. 70.

Nine states (Connecticut, Delaware, Iowa, Maine, Michigan, New York, Oregon, and Vermont) have this kind of deposit program for glass and all but Delaware include aluminum and some plastic beverage containers. Passage of several bottle bills in the northeast states led several distributors to form a bottle recycling business. The new business, New England CrInc., now recycles much more than bottles and is under contract to Massachusetts and Rhode Island to operate their MRFs. California has a significantly different deposit program that requires retailers to accept returns only if there is no recycling center within one-half mile. Under this scheme, recyclers, not manufacturers, are responsible for recycling or discarding the returned containers. This program has not achieved expected redemption rates for a variety of reasons and probably will be revised.²⁵

In addition to beverage containers, some jurisdictions have recently targeted tires, automobile batteries, and motor oil for redemption programs. Because of their volume and potential environmental hazards when discarded, these items cause special disposal problems. If properly separated from other trash, these products can be recycled easily. To ensure that they are recovered, some states have mandated deposits on batteries and tires or required sellers of tires, batteries, and oil to accept used items or provide a convenient drop-off center. Minnesota charges a \$1 fee on the sale of new tires which helps fund a tire-recycling facility in St. Louis County.

Another very recent and so far untested variation on the deposit idea is Florida's advance disposal fee that became effective in early 1989. Under this scheme, manufacturers are charged a small fee (1 cent per item) on containers that are not recycled at a sustained rate of 50 percent by 1992. If the 50-percent rate is not achieved and sustained by 1995, the fee increases to 2 cents. One goal of the program is to encourage industry support for recycling programs.²⁶

Reduced Transportation Rates

A frequent complaint of the recycling industry representatives is that freight rates discriminate against recyclables. Under deregulation programs of the last eight years, exact transportation rates are not available to the public, making it impossible to determine whether actual discrimination occurs or how common the problem is. In general, transportation costs have more of an impact on the use of recyclables than virgin materials because the supply of recyclables is so scattered and the markets are few. High freight costs can mean that many of these materials simply are not recycled. To help make the process more cost-effective for remote counties in the eastern part of the state, Oregon revised its transportation rate structure. Trucks and railcars returning empty from trips east are now able to haul recyclables back at lower-than-posted rates.

State Procurement Policies

Lack of demand for products manufactured from recyclables has kept investments in recycling equipment low. Some manufacturers and retailers believe that paper and other products made from secondary materials are inferior to products made from virgin materials. Recycled products also tend to be higher in price than newly made products. Price differences stem from a variety of factors. The recycling industry is still in its infancy and has not achieved economies of scale. The costs of virgin materials, on the other hand, are relatively low thanks to past production-facility siting, transportation rate structures, and federal subsidies (low-cost timber sales from U.S. Forest Service lands, the oil depletion allowance, and others).

²⁵Environmental Defense Fund, *Coming Full Circle* (New York, N.Y., 1988), pp. 72-73.

²⁶Jerry Powell, "The Top Contenders in New Recycling Legislation," *Resource Recycling*, September/October 1988, pp. 18, 19, 61.

To provide a source of demand for recycled products, 24 states currently have laws that "favor" procurement of these products.²⁷ Most of the state programs are for paper products, but some also include rubber-asphalt and metals. State laws range from general statements that state agencies should purchase products that contain recycled materials to price preferences for state purchases of recycled products. At least 11 states have price preferences for recycled paper with many allowing up to a 10-percent difference.

Some states also have a program that sets aside a specific level of state purchases for recycled products. For example, Maryland, which has one of the oldest and most successful procurement programs, requires that 40 percent of the state's paper purchases contain 80 percent "post-consumer" material. Post-consumer materials are those that are discarded by consumers (households, restaurants, offices) in contrast to industrial scrap, which is also called pre-consumer waste. The broad category of secondary materials refers to both post-consumer and industrial scrap.

While even a general statement that endorses procurement can express state confidence and interest in recycled products, price preferences and/or set-asides are especially important in the initial stages of a procurement program. Interestingly, despite a price preference of 10 percent, New York State has found that, on average, recycled paper costs only 2 to 3 percent more than virgin paper.²⁸

While state-procurement programs express preferences for and endorsement of recycling, their effect on the market for recycled products still is not clear. State-procurement requirements are relatively new (most are less than two years old) and manufacturers may be unaware of or slow to respond to them. State purchases of recycled items such as paper, however, are a small percentage of suppliers' annual paper sales, which tends to dilute the impact of individual state's policies on the marketplace.

State procurement policies have not had much collective effect on the markets because each state has its own definition of "recycled content." New York requires a minimum of 40-percent recycled fiber in its paper; Maryland requires an 80-percent recycled fiber content. This lack of uniformity lowers manufacturers' willingness to provide adequate supplies of products and contributes to the higher price of recycled products. This absence of common definitions for recycled products underscores the importance of federal guidelines. Federal procurement guidelines (discussed fully in the next chapter) issued to date apply only to purchases made with federal funds. However, such direction can set important precedents. Since federal guidelines for recycled paper were issued in June 1988, ten northeast states have agreed to adopt them for state purchases.

Manufacturers' Use of Recyclables

In addition to adapting procurement policies, states also have sought to increase private-sector demand for recyclables with economic incentives. These incentives include the following.

Exemptions and Tax Credits. A few states allow manufacturers exemptions from state sales tax for purchases of recycling equipment. But because most states with such exemptions have low sales tax rates, they do not create much of an incentive to buy. California has come close to enacting a credit for the use of secondary materials in production; the credit was passed by the legislature, but was vetoed by the governor. The credit was intended to help lower purchase costs and thus increase demand among manufacturers for recyclables.

Investment tax credit programs such as those in North Carolina, Oregon, and New Jersey are more common and easier to administer. North Carolina's tax credit covers recycling, source reduction, and

²⁷Richard Keller, "Key Elements in Buying Recycled Products," Address to the Sixth National Recycling Congress, Austin, Texas, October 15, 1987.

²⁸*Ibid.*

waste-minimization equipment. Availability of the credit is not well known and, as a result, is not effective in promoting recycling investments.²⁹ Oregon established two separate tax credit programs that include recycling investments. The most widely used is a 35-percent tax credit established in 1979 for energy-conservation investments and expanded to include recycling. A recent study of the credit indicates that it encouraged companies to invest in recycling equipment.³⁰ The New Jersey program, which allows up to a 50-percent credit for purchases of recycling equipment, has existed a bit over one year; no data are available yet on the number of businesses that have taken advantage of the credit.

Low-Interest Loans or Loan Guarantees. New Jersey offers a low-interest loan program which has spent \$3 million and assisted 12 businesses in its first three years of existence.³¹ No information is available on the extent to which the loans have encouraged business investments that would not have been made otherwise.

Direct Subsidies. Rather than influencing the market indirectly through credits or loan programs, some states offer direct subsidies to businesses. Typically these subsidies are included as part of a grant program that target specific recycling industries. Michigan, for example, offers grants for start-up and operation of recycling/composting programs. Rhode Island subsidizes statewide recycling by paying a private company \$23 per ton to operate a MRF that recovers and markets recyclable materials. The subsidy allows the company to sell the recovered materials at a low price. While \$23 per ton may seem high, it represents less than half the costs to landfill wastes in the state.

Matching Supply and Demand

Virtually every state in the country has some kind of "directory" that lists businesses that use recyclables. In some states, the directories are fairly sophisticated while in others, a file or bookshelf of information has to suffice. Directories can help match suppliers of recyclable materials (the drop-off centers, trash haulers, and the like) with buyers. The directories usually are state-specific and do not list businesses outside the state, although there may be buyers just across the border.

Research in New Technologies and Uses

In an effort to advance recycling technologies, several states have joined with industry and universities to sponsor research and development to find new and uses for recyclables, especially plastics. Rhode Island and Massachusetts, for example, sponsor the American Plastics Recycling Center at Lowell University which focuses on improving a process for using post-consumer plastics. New Jersey funds a similar organization, the Plastics Recycling Institute at Rutgers University, that is studying the composting of leaves and grass clippings.

States also are funding studies of nontechnological aspects of recycling. For example, several states have undertaken market-development studies to identify what incentives or other market initiatives may be needed to spur recycling industries. Illinois, Michigan, New Jersey, and Pennsylvania have sponsored studies that examine markets for recyclable plastics, used motor oil, used tires, and other selected recyclable materials.

²⁹Michigan Department of Natural Resources, *Options to Overcome Barriers to Recycling* (Lansing, Mich., 1987), as cited in EDF *Coming Full Circle*, p. 120.

³⁰Oregon Department of Energy, *Survey of Recycling Investments Certified for Tax Credit* (Portland, Oregon, January 1988), p. 1.

³¹Mary Sheil and Aletha Spang, *Recycling in Review: An Update on Eighteen Months of Mandatory Recycling in New Jersey*, p. 1.

Research and development, however, generally is not a large budget priority for states for many reasons. Research can be costly and drain resources that states need to implement programs. In addition, states are often reluctant to fund projects unless they see a clear opportunity to profit from any advances. The benefits of research are not easily identified or quantified. States may be unwilling to share any benefits that do accrue. This state-by-state approach to research lacks coordination and cooperation and results in costly duplication of effort.

States are beginning to fulfill a wide variety of roles to encourage recycling. For the most part, state involvement is welcomed by local governments, which have not always found recycling programs easy to begin or maintain. However, the full impact of state recycling programs is still unknown, in part because the programs are so new. Even as programs mature, however, determining the effectiveness of a single initiative may be difficult. The success of recycling depends on many different factors. The most important contribution of states may be the leadership and willingness to devote attention and resources to waste reduction.

4. Federal Initiatives in Source Reduction and Recycling

As more communities feel the burden, directly or indirectly, of growing disposal problems, pressure will increase for federal action to supplement and support local and state actions. A wide range of federal initiatives is under consideration; some would amend the Resource Conservation and Recovery Act (RCRA) while others would require separate legislation. The federal government can ease disposal problems by encouraging waste reduction.

This chapter outlines some of the issues that Congress will have to confront in designing solid-waste reduction legislation. It also discusses potential federal initiatives to address some of these issues. The approaches suggested would not replace or subordinate the important role of state and local governments in solid-waste management. Rather, the federal role must be one of cooperation and support for states to develop their own programs and improve existing waste-reduction efforts. Three areas require federal attention and resources: market incentives, research and development, and state programs.

Market Incentives

One of the most important federal roles is in development of market incentives for waste reduction. Current market conditions do not provide sufficient incentives or rewards for source reduction and recycling to become important solid-waste management methods. Some states are attempting to provide incentives through enhanced consumer awareness, tax advantages, market subsidies, and other devices. While these programs may yield some results within a specific state, the lack of program consistency across state lines limits the benefits. In addition, state market-development efforts may not keep pace with the supply of recyclables, resulting in stockpiles or ultimate disposal of the recyclables.

Federally sponsored incentives will be needed for many states to reach their source reduction and recycling goals. A review of state activities in market development shows that a variety of incentives, from tax credits to procurement policies, could work. Two categories of market incentives should be developed: source-reduction initiatives and market demand for recyclable materials.

Source-Reduction Incentives

To help state and local efforts, the federal government must influence the supply by working directly with manufacturers to encourage development of products that are less materials-intensive and less toxic. EPA recently proposed a program of conferences and seminars with manufacturers and product-design professionals to reduce wastes at the source through product design and packaging changes. EPA also has proposed a corporate-recognition program to "reward" companies publicly for successful reduction efforts.³²

Technical assistance to industry will help, but real progress in source reduction will need more than a few conferences and publicity. Manufacturers will not invest in source-reduction techniques without federal regulations or incentives or both. Regulations could involve establishment of standards to extend the useful life of products or to reduce the volume or toxicity of materials used in products and packaging. Standards for a limited number of products, packaging, or "problem" items such as those containing toxic substances, for instance, may be beneficial. More research is needed, however, on the potential benefits and impact of product standards. Some designed to achieve source reduction may

³²Environmental Protection Agency, *The Solid Waste Dilemma, An Agenda for Action* (Washington, D.C., September 19, 1988), pp. 41-47.

conflict with recycling; more durable products, for example, may make recycling difficult. New standards also would have to accommodate public health concerns related to packaging such as tamper-resistant containers.

Disposal Surcharge

A product-based disposal surcharge potentially could offer significant benefits. Under this scheme, the price of all or some subset of products would include disposal costs. If the average disposal rate for certain items were \$50 per ton, manufacturers would be charged \$50 for every ton of material used in production. To keep manufacturers from simply switching to lighter-weight materials (e.g., substituting plastic for glass) a separate, comparable charge would be imposed on high-volume items such as rigid containers.

The disposal surcharge is attractive for several reasons. It would spread disposal costs more equitably by incorporating them into the manufacturing process and would begin to compensate for market systems that ignore products' life-cycle costs. In raising the cost of materials, this surcharge also could give manufacturers the incentive to reduce the total material content of their products. Allowing an exemption from the charge for use of post-consumer wastes would give manufacturers the choice of reducing total material content or using recyclable materials in their products.

EPA studied the product-based disposal surcharge in the late 1970s at the request of Congress. The study evaluated paper products and nonpaper packaging materials, which make up 70 to 80 percent of the total nonfood content of municipal waste streams and most of short-lived, nondurable goods. Preliminary results indicated that the surcharge could be effective in spurring recycling and source reduction. The study estimated that a product charge of \$26 per ton (which represented the average cost of disposal at that time) would reduce virgin packaging-material consumption by 8.6 million tons per year; source reduction would account for about 10 percent and recycling about 90 percent of the cut.³³

The level of the surcharge will affect the size of its impact. A relatively low charge, such as the \$7 per ton on virgin materials used in packaging and 7 cents per rigid container proposed in the Waste Minimization and Control Act of 1988 (Senate Bill 2774), would provide little incentive for manufacturers to reduce overall content or use recyclable packaging materials. Even a small charge, however, can begin to draw the attention of manufacturers and product designers to the full life-cycle costs of their products. A small charge also could generate revenue. The Congressional Research Service (CRS) estimated that the proposed S. 2774 surcharge could raise as much as \$500 million each year.³⁴ This revenue could be used to fund technical assistance programs for manufacturers to find ways of lowering the volume and toxicity of materials in their products, or to fund new technologies or processes for using more post-consumer materials.

One concern raised about the product surcharge is the difficulty of administering it. EPA's study concluded that the administrative requirements of the product charge are comparable to manufacturing excise taxes such as those for highway maintenance (taxes on gasoline and oil) or fish and wildlife conservation programs (taxes on sporting equipment). Assessment of the disposal charge early in the manufacturing process would minimize the number of collection points. Limitation of the product charge to paper products and nonpaper packaging materials would mean that fewer than 14,000 establishments would be affected. If the tax were limited even more, for example, imposed only on

³³Environmental Protection Agency, *Fourth Report to Congress: Resource Recovery and Waste Reduction* (Washington, D.C., August 1977), pp. 88-98.

³⁴James McCarthy, "Memorandum on Tax Options to Support Subtitle D Programs" (Washington, D.C., Congressional Research Service, March 1988), p. 14.

packaging and containers as S. 2774 proposed, estimates by CRS show that fewer than 10,000 businesses would be affected.³⁵

Market Demand for Recyclables

Federal help to increase the market demand for materials is essential to accommodate any surge in recycling. While a reliable supply of recyclable materials would be important, supply incentives are more appropriate and successful when developed at the local and state levels, where they can be adapted to local conditions and practices.

Two courses of action are most feasible for federal action to increase the demand for recyclables. One is to increase demand directly by ensuring that federal procurement policies include recycled products in purchase arrangements. The other is to enhance private-sector demand.

Government Procurement Policies

Fulfilling procurement requirements with recycled products offers a way for the federal government to set an example and provide a reliable source of demand. In RCRA Section 6002, Congress required that all purchases of \$10,000 or more made with federal funds must be of the highest possible percentage of recovered materials. EPA was required to issue guidelines that assured the use of such materials. After several years of delay and a successful lawsuit by several public-interest groups, EPA recently issued guidelines for recycled content in paper, rerefined lubricating oil, and retread tires. A guideline for fly ash in concrete was issued in 1983. EPA also has proposed standards for asphalt containing ground tire rubber and insulation material, but these are not yet final.

The guidelines must be improved in several respects if they are to be effective in providing a reliable source of demand for recyclables. The issue of "unreasonable price" must be clarified. RCRA Section 6002 provides that procurement requirements do not apply if products "are only available at an unreasonable price." EPA has adopted a strict interpretation of this clause that does not allow a price preference for recycled products; recycled-content products must be the same price or lower than similar products. Presently, few recycled-content products are comparable in price to similar products made from virgin materials. The reasons for the price difference are varied. They include the experience of the recycling industry, which is still fairly new; past production-facility siting; transportation rate structures; and federal subsidies of natural resources through low-cost timber sales, oil depletion allowances, and the like. In refusing recyclables a price preference, EPA's guidelines do not realistically provide them a market.

Another factor that limits the guidelines' effectiveness is the lack of wide application. Congress should encourage states to use the guidelines for all purchases of relevant products, not just purchases of \$10,000 and over using federal funds. Congress also could require private businesses with large federal contracts to comply with the guidelines. Wider application of the guidelines means greater potential demand for recyclables. If more agencies adopted the same guidelines, manufacturers would produce more and cheaper recycled products. At present, states have different definitions and requirements for the recycled content of paper. This lack of consistency complicates the manufacturing of recycled papers, making them specialty rather than lower-priced stock items.

Congress should direct EPA and the Department of Commerce to work with other federal and state agencies to ensure that the guidelines are followed. A set-aside program would ensure that the guidelines are used for some minimum level of purchases. An agency could require, for example, that 25 percent of federal purchases of paper must include a minimum of 50-percent recycled paper content. Maryland has had a successful set-aside program since 1977 that calls for 40 percent of state purchases to include at least 80-percent recycled content. A set-aside program has the advantage of more assurance

³⁵ *Ibid.*

that agencies will buy the products and less reliance on the good will of agency procurement officers. Procurement policies often carry the burden of changing social agendas, which makes inclusion of more guidelines problematic without a specified amount devoted to recycled products. A set-aside program, however, needs some kind of limit on the price paid for recyclables; a set-aside alone would allow purchases of recycled products without any regard to costs.

Either a set-aside or price preference or both are important for getting procurement programs started. Both Maryland and California, states with aggressive procurement programs, found that recycled products eventually became competitive with products made from virgin materials.³⁶

Private-Sector Demand

The federal government could enhance private-sector demand for recyclables in a variety of ways. The federal tax code could provide incentives directly through tax credits to manufacturers either for investments in recycling equipment or for the purchase and use of recyclables in the manufacturing process, referred to as "secondary materials use credits." Tax credits lower the costs and therefore increase demand for the materials themselves or the equipment needed to use materials.

California has come close to enacting a secondary materials use credit, but to date no state has actual experience with one. In many respects the product-based disposal charge discussed above has an effect similar to the secondary materials use credit in allowing a tax exemption for use of post-consumer materials in manufacturing.

Several states have used investment tax credits with varying degrees of success. In Oregon, where the corporate tax rate is high, the 35-percent tax credit for recycling investments has proved an important factor in expanding private-sector demand.³⁷ Another study done for Illinois, however, indicates that the tax credit is less effective in states with lower corporate tax rates.³⁸ With federal taxes on corporations at their current low, an investment tax credit would have to be relatively high to provide sufficient incentive for companies to invest in the equipment needed to make total or partial use of recyclables in manufacturing.

Economic development programs are alternatives to tax credits in boosting private-sector demand. They include special loans, subsidies, counseling centers, and technical assistance targeted to specific industries or geographic areas. The federal government has supported economic development for decades and already has several effective programs in selected industries. While recycling industries are not excluded from these programs, generally the federal agencies involved in economic development are unfamiliar with the unique aspects of recycling or with methods of helping recycling industries. Three federal programs that could help these industries include export promotion, tax-exempt finance, and low-interest loans and guarantees.

Export Promotion. Export markets are an important and growing source of demand for recyclables. Wastepaper is one of the largest exports from the port of New York--most of it destined for the resource-poor Asian countries. The Department of Commerce offers a wide range of programs to promote exports that could provide valuable assistance to recycling businesses. In particular, the U.S. and Foreign Commercial Service Unit, which works with commercial officers in overseas embassies to identify foreign markets and opportunities, should be encouraged to seek markets for recyclables and recycled products and to work with states and counties to ensure that materials meet foreign-market specifications.

³⁶Environmental Defense Fund, *Coming Full Circle*, p. 98.

³⁷Resource Conservation Consultants, *Survey of Recycling Investments Certified for Tax Credit*, pp. 1-5.

³⁸Illinois Department of Energy and Natural Resources, *Feasibility of Tax Incentives for Purchases of Recycling Equipment or Recycled Products* (Springfield, Ill., May 1987), pp. 1-4.

The federal government also provides financial assistance to export businesses through the Export/Import Bank. While this agency offers several types of financing, the only help presently offered to scrap businesses is short-term insurance for the purchase price of shipments in case of nonpayment by the overseas buyer. It appears, however, that despite a rise in number of exports, recycling businesses are not buying the insurance as much as they did formerly. The \$46 million in insurance purchased from the Bank for scrap shipments in fiscal 1987 dropped almost 50 percent in fiscal 1988.³⁹ While recycling industries might have needed protection initially, insurance may not be as important now thanks to foreign demand increases or greater experience among U.S. businesses in exporting recyclables. The Export/Import Bank now should review existing programs and identify others that could meet the changing needs of recyclable-export firms.

Tax-Exempt Financing. An important federal economic development tool for state and local governments is the industrial development bond (IDB). State and local agencies issue these bonds, which pay interest that is exempt from federal taxation. This exemption reduces the yield that investors demand, which in turn lowers the cost of capital borrowed through the bond issuance. IDBs have been used for a wide range of activities; they are popular with state and local governments because of their versatility. The Tax Reform Act of 1986, however, placed severe limits on the use of IDBs through eligibility and volume restrictions.⁴⁰ The current program allows IDBs for solid-waste disposal facilities, but typically they have funded incinerators, not recycling facilities. The new restrictions also limit usage of the bonds for public-private partnerships that are necessary for recycling. Expansion of the use of IDBs to include a range of recycling projects would provide states with more low-cost tools to support recycling markets. IDB financing for incinerators could be reserved for communities with recycling plans or banned completely, thereby eliminating one of the artificial advantages of incineration.

Low-Interest Loans/Loan Guarantees. Low-interest loans and loan guarantees for investments in recycling equipment and operations can lower their financing costs. New Jersey's low-interest loan program provided approximately \$3 million to 12 businesses in its first three years.⁴¹ The federal Small Business Administration offers loans and loan guarantees to help small businesses unable to obtain conventional financing. In 1987, SBA issued loans totaling over \$2.5 billion for over 16,000 small businesses. According to SBA records, however, fewer than 19 of these loans were for recycling investments.⁴²

Research and Technology Transfer

Federal support for research is especially important to encourage cooperation and avoid duplication among existing state-sponsored research programs, provide the resources for new research beyond state means, and fund projects without direct pay-offs to individual states. Research and development is crucial to increased recycling and the inclusion of more than glass, aluminum, and newspaper--materials for which recycling technologies already are well developed. New technologies should be developed and tested before solid waste problems become critical.

³⁹Interview with Elizabeth Duff, Policy Analyst, Export/Import Bank, Washington, D.C., November 16, 1988.

⁴⁰Charles Bartsch, ed., *The Guide to State and Federal Resources for Economic Development* (Washington, D.C.: Northeast-Midwest Institute, 1988), pp. 365-367.

⁴¹Mary Sheil and Aletha Spang, *Recycling in Review: An Update on Eighteen Months of Mandatory Recycling in New Jersey*, pp. 1-10.

⁴²Small Business Administration, "Data on business loan approvals for SIC code 5093" (Washington, D.C., December 16, 1988), p. 1.

RCRA established a program for demonstration grants and technology transfer. Several projects began in the late 1970s, but the past eight years have seen little activity. The program should be revived and supported. An updated federal research and technology transfer effort could have many facets.

Research and Demonstration Grants

States and universities need funds to develop technologies for source reduction and recycling. Targeting grants to states and institutions already committed to waste reduction would extend the value of the grants and make them an incentive. Demonstration projects are needed in recycling of plastics and yardwastes, which represent large portions of the nation's waste stream. More research is needed in manufacturing processes and products that substitute nontoxic for toxic materials and other waste-reduction technologies. Research also is needed to identify specific products or components of products that create problems for reuse, recycling, composting, incineration, or landfilling. Such research could help to determine whether restrictions are needed to mitigate disposal problems and what type would work best.

National Clearinghouse

EPA should set up a national clearinghouse of information on successful source reduction and recycling as well as coordinate the sharing of information developed from the research and demonstration grants. Considerable information exists already that could benefit states, communities, and businesses as they undertake source reduction and recycling programs. In creating a centralized source for information, a national clearinghouse might prevent some of the costly duplication in research that currently occurs. The clearinghouse functions could include maintenance of a computer database with public access, sponsoring conferences and workshops, and providing information that states and communities can use in consumer-education programs.

Technical Assistance to States

Under any scheme, the states will be called upon increasingly to help communities and industry in developing waste-reduction programs. Many states already expect to provide assistance to industries for hazardous waste reduction and should be encouraged to develop similar programs for nonhazardous wastes. To do so, however, the states need information about what works and what can be expected for reduction of both municipal and industrial wastes.

State Programs

States can play an important role in solid-waste management, especially in providing leadership and support to local efforts. As described in Chapters 2 and 3, states are beginning to fulfill this role, but generally lack information and guidance on how to achieve their goals. Inconsistencies among state programs, especially in market development, hurt the progress of source reduction and recycling. The federal government can and should be involved in establishing consistent standards, encouraging all states to develop waste-reduction programs that address their needs and conditions, and supporting cooperative efforts among states.

Planning is an essential first step to responsible waste management. All states should be strongly encouraged to develop solid waste plans that include waste reduction. Congress has the difficult task of ensuring that adequate plans are developed. Congress first dealt with solid-waste planning in 1976 through provisions in RCRA that gave EPA money for grants to states to develop plans with agency guidance. The grant money served as an effective inducement to states to submit plans; almost every state submitted one. More than half, however, were rejected initially by EPA as inadequate. Congress could take several steps at this point.

Congress could require states to address source reduction and recycling in their solid-waste management plans. Such a requirement could direct states to specify how they plan to meet federally mandated goals (for example, EPA's minimum goal of 25 percent recycling and source reduction). Some states would meet federal goals easily while others would encounter more problems and costs. Another alternative would give EPA the authority to require that states conduct detailed studies of disposal-capacity needs, waste composition, and long-term costs of all management options, including source reduction, recycling, incineration, and landfilling. This approach would allow each state to design a program that best addresses its own needs and would encourage its officials to analyze waste composition, future disposal needs, and costs. Completion of a detailed cost analysis may be enough to convince state officials that source reduction and recycling are the most cost-effective options over the long term.

Once their plans are approved, states must take action. Congress could create mechanisms to help states implement solid-waste programs. In the past, grants for plan development alone have not paid off. Most states developed plans, but many then ignored them. Few states relied on their plans to manage solid waste and even fewer updated their plans. When funding for the grants program ended in 1981, most states simply dropped solid-waste planning efforts altogether.

EPA could establish a new program to give program-implementation grants once a plan is approved. For example, EPA grants could go specifically for some aspect of source reduction or recycling, such as technical assistance to industry for waste-reduction advice or consumer-education programs. To be eligible for funding, the state solid-waste plan would have to include a description of its waste-reduction program and an estimate of the costs.

Another avenue, one that requires no federal outlays, would threaten a state with withdrawal of existing funds or authority if its programs were inadequate. States with approved plans could be offered some new, desirable authority. Because no federal funds currently are available for solid waste, funding for some other program (e.g., Superfund) would have to be sacrificed for this scheme. Such action could create or compound problems in other programs. EPA ought to consider withdrawing a state's authority to permit new disposal facilities if its program is inadequate. This option is attractive because it ensures that a state has studied its needs adequately before a new facility is permitted. However, this action could further delay construction of badly needed new disposal facilities.

Many states, especially those in the Midwest and West, would welcome the authority to prohibit disposal of out-of-state wastes. Under the commerce clause of the Constitution, states cannot restrict interstate transport of wastes arbitrarily. Ohio and West Virginia recently enacted laws to prevent the entry or limit the amount of out-of-state wastes by levying a surcharge on all nonseparated wastes. The authority to restrict out-of-state solid wastes could provide these states, and others with adequate disposal capacity, with an important enticement to develop solid-waste plans. These are the very states that otherwise might not develop comprehensive programs, especially ones that include recycling and source reduction. Others, especially New Jersey, would be affected drastically by such a change; New Jersey currently ships over 50 percent of its wastes to other states.⁴³ The state, however, is already under pressure from other states to become self-sufficient.

Conclusion

A federal effort for source reduction and recycling of solid wastes would benefit from consideration of the following suggestions.

⁴³Mary Sheil and Aletha Spang, *Recycling in Review: An Update on Eighteen Months of Mandatory Recycling in New Jersey*, p. 1.

- A product-based disposal surcharge is needed to incorporate the life-cycle costs of products into production costs. A surcharge also could generate revenue to fund other programs for source reduction and recycling.
- Improvements should be made to existing procurement policies and economic development programs to include public and private-sector demand for recyclable materials.
- A coordinated program should be set up for research and technology transfer that includes demonstration grants, a national clearinghouse, and technical assistance to states and industry.
- Requirements and incentives should be developed for states to evaluate and implement waste-reduction programs as part of overall waste management.

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Appendix A

Highlights of State Legislation and Programs in Source Reduction and Recycling¹

This appendix provides highlights of each state's recent legislation or working program in source reduction and recycling. It does not cover every aspect of every state's recycling program, but rather describes some of the initiatives that states have enacted as of December 1988. Sources for the information vary for each state and include published documents and articles, statutes, and other written materials as well as telephone interviews with state staff.

Alabama

The Alabama Department of Environmental Management provides technical assistance to communities and businesses when requested and maintains a reference file of recycling information. The department also has a directory of about 200 businesses that buy recycled materials, primarily aluminum, glass, and paper.

Alaska

The Alaska Department of Environmental Conservation waste-reduction and recycling program was virtually eliminated in budget cuts in 1986/87. A state rule still requires any entity generating more than 100 tons per year of recyclable wastes to provide for collection and recycling of those wastes. However, this requirement has been applied only to junk cars and has seldom been enforced. Procurement policies that encourage state agencies to purchase recycled products have been softened and are not used in practice.

Arizona

No statewide recycling program exists. The city of Phoenix has a pilot recycling project for source separation of trash. A special legislative committee was created in July 1988 to study potential solid-waste recycling legislation.

Arkansas

Solid-waste planning requirements for localities refer to, but do not require, recycling. The state recently contracted for a feasibility study of a multicounty recycling program and is examining possible funding mechanisms for recycling-related activities and equipment.

California

The California Beverage Container Recycling and Litter Reduction Act of 1986 differs from typical bottle-deposit programs in several respects. Consumers return beverage containers to recyclers rather than bottlers. The current redemption value for each container is 1 cent, but may increase for types of

¹Robert Nagel, research assistant with the Northeast-Midwest Institute, provided extensive help in compiling this appendix.

containers that are not redeemed at the rate of 65 percent. Recyclers are responsible for processing and marketing the recovered materials. If recyclers are unable to cover their costs, bottlers and other container manufacturers must pay the difference. Unredeemed deposits are distributed as follows: 65 percent is returned to consumers as a bonus on top of the penny deposit; 10 percent is used for litter-abatement programs via grants to Civilian Conservation Corps-type programs; 10 percent is used for recycling information education and promotion; 10 percent goes to zones with special marketing problems; and 5 percent goes to administrative costs. The recycling act was expanded in 1988 to include wine-cooler containers. The California Department of Conservation's Division of Recycling is responsible for administering the program and conducting education-promotional efforts to encourage public participation.

Other laws add to the state's recycling efforts.

- Plastic containers must be labeled as to resin content, which eases recycling of these items.
- Landfill permits are banned until plans for 20-percent recycling are in place.
- Procurement requirements for paper specify a minimum 50-percent recycled content, of which 10 percent must be post-consumer wastes. The procurement law allows a 5-percent price preference up to \$50,000. The Department of General Services is to indicate whether items listed in its procurement catalog are made from recycled materials.
- Provisions affecting state agency recycling include collection service for wastepaper in all state offices and in and around the capitol building. Members of the legislature are requested to order and use recycled office supplies.

In 1988, the state legislature passed a long list of initiatives that were vetoed by the governor. They included: a 25-percent recycling requirement for municipalities; state procurement of recycled material in addition to paper; a tax credit for the use of recyclables in manufacturing; and a ban on the manufacture, distribution, and sale of products containing chlorofluorocarbons.

Colorado

State agencies are required to recycle office paper.

Connecticut

The state established a bottle-deposit program in 1980 that includes a minimum 5-cent deposit on beer and soft-drink containers. In 1986, the legislature established a \$10 million trust fund for the development of municipal solid-waste recycling programs. The legislation required the Department of Environmental Protection (DEP) to develop a recycling plan for the state, which was completed December 1986. This plan, approved by the legislature in 1987, emphasizes a regional approach to recycling. The plan calls for the construction of seven to nine intermediate processing centers, each of which will serve 250,000 to 400,000 residents. Each region must submit a plan to DEP with the following components:

- residential recycling;
- commercial mixed waste sorting;
- commercial/industrial recycling;
- residential waste reduction;
- commercial/industrial waste reduction;
- backyard composting of organics; and
- central composting of yardwastes.

State grants are provided for planning and formation of regional groups, preliminary engineering and other technical work to analyze a regional recycling program, and implementation of the regional programs. A subcommittee of the Municipal Solid Waste Advisory Council was formed, which reviews ways to promote source reduction.

A 1988 law further promotes recycling in the following ways:

- allows a 10-percent price preference for recycled products;
- requires state agencies to implement recycling;
- requires a study of recycled-materials use in highway construction;
- requires labeling of plastic containers by materials type by 1990;
- bans the "plastic can;"
- prohibits landfilling or incineration of lead-acid batteries after 1990; and
- requires studies of packaging and other materials to determine the environmental impact from incineration.

Delaware

Delaware has had a glass beverage container deposit law since 1982. In addition, the Delaware Solid Waste Management Authority operates a statewide facility in Wilmington. Unseparated solid waste is sorted using air, magnets, conveyors, and chemicals to recover glass and aluminum. Of the remaining materials, the inorganic combustible material, primarily paper and plastics, is shredded and fed to an adjoining incinerator. Organic material is composted on site.

District of Columbia

Mandatory recycling legislation signed in January 1989 phases in source separation of recyclables (newspaper, glass, and metals) by 1990. The new law also promotes city procurement of recycled products.

Florida

A new recycling law was enacted in June 1988 that calls for a 30-percent reduction in wastes by 1994. The state will cut off funding to local jurisdictions without source-separation programs in place by July 1989. The Department of Environmental Regulation (DER) funds technical assistance and gives grants to help communities develop these programs, conducts promotional and educational activities, and maintains a market directory of recycling businesses.

Under the new law, virtually every type of consumer-product container is subject to an "advance disposal fee" of 1 cent unless that type is recycled at a rate of 50 percent statewide. Beginning in 1992, the fee jumps to 2 cents per item. Other provisions of the law include:

- a sales tax exemption for recycling and resource-recovery equipment;
- a \$1 fee on new tires to help finance recycling;
- elimination of plastic shopping bags that do not degrade in 120 days;
- a requirement that polystyrene food packaging and plastic-coated paper disintegrate within one year; and
- a requirement that plastic containers be coded by resin type after June 1990.

To encourage recycling of newsprint, the law charges newspaper publishers a 10 cent-per-ton disposal fee, which jumps to 50 cents in 1992 if a 50-percent recycling target is not met. Publishers using recycled newsprint receive a credit for disposal-fee payments. The law specifically prohibits landfilling of used motor oil, yardwastes, lead-acid batteries, scrap appliances, and scrap tires. Battery retailers must accept used lead-acid batteries as trade-ins for new ones.

Procurement policies encourage state agencies to purchase recycled products and allow a 10-percent price preference. State agencies also must test the use of various recycled products such as compost and mixed plastics. The new law requires DER to conduct several studies including market development

analyses to identify potential reductions in packaging. It also contributes toward a joint industry-government project on plastics degradability.

Georgia

No statewide recycling effort exists at present, but the legislature recently held hearings on a proposal to begin one. The Department of Natural Resources once had a recycling coordinator, but the position lapsed. Georgia Clean and Beautiful (administered by the Department of Community Affairs) acts as an information clearinghouse and publishes a recycling directory.

Hawaii

The legislature considered a proposal to establish a comprehensive, statewide program for recycling, but amended it to fund a study of the state's waste stream. Consultants were to complete the study by early 1989.

Idaho

The Idaho Department of Environmental Quality publishes a directory of markets for recycled materials.

Illinois

Under the Solid Waste Management Act of 1986, the state imposed a solid waste fee, currently \$0.60 per cubic yard for waste disposed at landfills or incinerators. Local governments may charge a maximum of \$0.45 per cubic yard above the state fee. In 1992, the state fee decreases to \$0.45 per cubic yard as the local fee increases to \$0.60 per cubic yard. Revenue from the state fee goes to the Solid Waste Management Fund.

The Solid Waste Planning and Recycling Act of 1988 requires counties of more than 100,000 population and the city of Chicago to develop comprehensive waste-management plans that emphasize recycling and landfill alternatives by March 1, 1991. Plans must include a recycling program designed to recover 25 percent of the municipal waste by the fifth year of operation. Plastic bottles must be coded to indicate their composition by 1991.

The Department of Energy and Natural Resources (ENR) and Central Management Services (CMS) must undertake wastepaper-collection programs in at least five state buildings. State agencies are encouraged to deposit the money received for recycling the paper into the CMS Surplus Property Fund. That money can be used to establish more wastepaper-collection programs and buy recycled paper for office use. State purchases of recycled products must be 10 percent by 1989, 25 percent by 1992, and 40 percent by 1996, by which time paper and forms must have a minimum 40-percent recycled content. The plan calls for ENR to report to the legislature on scrap tires; ENR and CMS together are to study new uses for used motor oil and ways to reduce industrial and post-consumer waste. ENR and the Illinois Board of Education are to conduct public-education programs on solid waste-management and recycling.

ENR provides low- or no-interest loans to businesses and not-for-profit and governmental organizations for recycling efforts. Loan repayments go to the Solid Waste Management Fund. The fund also gives grants to help finance local recycling programs. All agencies that maintain public lands are required to use compost materials if possible.

Indiana

No statewide recycling program exists yet, but the legislature is considering a bill that provides recycling/resource-recovery grants funded by a disposal surcharge.

Iowa

Iowa has had a mandatory deposit on beer, soft drink, wine, and liquor containers since 1979. Its 1987 Comprehensive Groundwater Act set a hierarchy of disposal methods that local governments must address before their landfills can receive operating permits. A landfill operator must take lead-acid batteries to be recycled.

The state awards "landfill alternative grants" funded by a disposal surcharge, currently \$1.50 per ton. The fee will rise 50 cents per ton per year until it reaches \$3.50 per ton. The county retains 50 cents of the surcharge and the remainder goes for grants. Counties, cities, and smaller communities as well as public and private agencies are eligible for the grants, which usually fund demonstration projects. A city recycling program, a co-composting project, and a public-education effort for volume reduction are among the projects funded. About \$1.5 million was awarded in fiscal 1988 and 1989.

Legislation enacted in 1988 provides tax incentives for the use of degradable packaging products and encourages state procurement of starch-based degradable plastics and soybean-based inks. The law also bans nondegradable six-pack rings.

Kansas

No statewide recycling program exists.

Kentucky

No statewide recycling program exists.

Louisiana

The legislature formed six ad hoc committees to prepare proposals for the next session on the following problem areas: paper and newsprint; batteries, tires, and white goods; packaging; compost; used oil; and state procurement.

Maine

The state has required deposits on beer and soft drink containers since 1979. The Office of Waste Recycling and Reduction Initiatives, established within the Department of Economic and Commercial Development, completed a report to the state legislature in December 1988 that outlines a program to promote source reduction and recycling. The report contains 37 recommendations for legislative action, including the following:

- a goal to reduce waste by 25 percent (includes composting);
- removal of sales and use tax and enactment of a provision for accelerated depreciation on recycling equipment and facilities;
- a surcharge on tires and new white goods (appliances);
- a requirement that municipalities with populations of 10,000 or more submit recycling plans by 1991;
- grants to local governments for feasibility studies and implementation of recycling plans;
- a statewide education-promotion program and development of educational curricula for grades K-12;
- expansion of the bottle-deposit program to include noncarbonated beverage containers;
- a ban on landfilling or incineration of yardwastes and funding of four pilot projects involving composting;
- the labeling of plastic containers by resin content; and

- a 20-percent set-aside for state paper purchases of recycled paper, with a 5-percent annual increase until recycled paper reaches 50 percent of state purchases.

The 1988 law banned the sale of polystyrene foam products containing CFCs.

Maryland

A mandatory recycling law, enacted in 1988, requires that the seven largest counties (with populations over 150,000) develop recycling plans that reduce waste by a minimum of 20 percent. All other counties must develop plans that reduce wastes by a minimum of 15 percent. Recycling plans are to be submitted by July 1990 and fully implemented by January 1994. The state will not issue permits for solid waste incinerators unless the county has an approved recycling plan. If the county has not submitted a recycling plan by January 1992 or fails to achieve the goals specified by 1994, the Department of Environment can prohibit issuance of new building permits.

The new law also establishes an Office of Recycling within the Department of Environment to be responsible for administering the law and providing assistance to counties. The department expects to distribute at least \$500,000 in grants to smaller counties in 1989 for the development of recycling plans.

Under a separate program, the Maryland Environmental Service (a quasi-state agency/public utility) provides loans for recycling projects. The Environmental Service had \$500,000 available for recycling loans in 1988. It publishes a market directory that provides information on preparing and selling recovered materials.

Maryland has one of the nation's oldest procurement requirements for recycled products. Enacted in 1977 for paper only, the law required that the state buy 40 percent of its paper with recycled content (defined as minimum of 80-percent post-consumer materials) by 1985.

Massachusetts

The state's bottle deposit law, enacted in 1983, was extended recently to include wine coolers. The Solid Waste Disposal Act of 1987 provides \$25 million in financial aid to cities, towns, and public entities for recycling projects and \$10 million for special waste-recycling projects such as composting.

The Department of Environmental Quality Engineering (DEQE) developed a six-region recycling plan with a goal of 25 percent for all. Each region will have a materials recovery facility built by the state to serve approximately 450,000 residents. The MRFs will process glass, cans, newspaper, and cardboard. Communities must pass mandatory recycling ordinances, collect recyclables, deliver them to the MRF, and conduct ongoing public-education activities. DEQE will study each region's collection methods to determine the best.

A grant from the state's Centers of Excellence helped to create the Plastics Recycling Applied Research Institute, which will operate an experimental mixed-plastics recycling plant processing 10,000 tons per year. Once perfected, the technology will be installed at the MRFs. DEQE already has established ten model composting operations throughout the state. The state plans to have 25 percent of municipalities composting by 1989. The state also compiles a market directory for recyclable materials.

In May 1988, the governor signed an executive order requiring state agencies to purchase recycled products whenever possible. That fall, DEQE issued a comprehensive action plan and draft regulations that encouraged state agencies to purchase recycled paper, steel, aluminum, plastics, and compost. The regulations include a 10-percent price preference for purchases and require an annual study on the need for continuing price preferences. The regulations ban state purchases of disposable polystyrene products made with CFCs. One issue that remains unresolved is a ban on sales of containers made with polystyrene.

In the 1988 session legislators debated, but did not enact, a packaging tax that would include a 3-cent per container charge with credits and exemptions based on recyclability.

Michigan

Michigan has a tiered deposit program that requires a 5-cent deposit on refillable containers, 10-cent deposit for nonrefillable glass and aluminum containers, and 20-cent deposit for large plastic soda containers.

The Clean Michigan Fund, administered by the Department of Natural Resources (DNR) since 1985, funds research projects including waste-stream studies and recycling/composting studies to determine the feasibility of recycling in areas of various geographic features and populations densities.

Counties are required to submit and update solid-waste management plans. A 1988 law stipulates that the next update, due in January 1989, must contain a feasibility study of recycling for that area and an implementation plan for any projects undertaken.

The State Solid Waste Policy, signed by the governor in spring 1988, sets an aggressive agenda to reduce dependence on landfills by 80 percent. A recently passed Solid Waste Alternatives bond issue provides \$150 million to fulfill the policy. DNR's plans include financial support for landfill closures, private and public recycling/composting projects, waste-reduction research and demonstration projects, market development for recyclables, household hazardous-waste collection centers, and waste-to-energy projects. DNR also intends to pay all capital costs for selected "model community" recycling programs.

Laws enacted in 1988 phase in requirements that specify minimum percentages for state purchases of products made from recycled materials and allows a 10-percent price preference for such purchases. The state will purchase 10 percent of all supplies, materials, and equipment of recycled materials in 1989; it will buy a minimum of 15 percent in 1990 and 20 percent or more in 1991. Recycled products can include paper products, plastics, oils, solvents, asphalt, glass, tires, ferrous and nonferrous metals. State agencies must purchase recycled paper according to a set schedule: 30 percent with a minimum of 25-percent recyclable material content in 1989; 40-percent purchases of 35-percent recyclable content by 1990; and 50-percent purchase of 50-percent recyclable content in 1991 and after. State agencies also must undertake wastepaper-recycling programs with the goal of recovering 85 percent of the paper by the year 2000.

A December 1988 executive order requires state agencies to perform tests and demonstration projects for recycled products. Among those mentioned in the order is a project that requires DNR to establish a special state park that uses recycled products in the facilities and operations as much as possible.

Minnesota

The Solid Waste Management Act of 1980 requires counties to prepare solid-waste plans that address the hierarchy of waste management that includes reduction, recycling, incineration, then landfilling. Plans must be approved to permit new disposal facilities.

The Minnesota Waste Management Board provides financial assistance to local governments for the initial costs for solid-waste management alternatives--recycling, composting, incineration. Market-development grants target weak markets. The state has allocated \$200,000 for public and private organizations to assess the feasibility of developing facilities and services to support markets for the state's recyclable wastes.

Amendments to the Solid Waste Management Act in 1987 and 1988 included a ban on the plastic can and nondegradable six-pack yokes and required the labeling of plastic containers according to resin

content. It also bans landfilling or incinerating yardwastes, lead-acid batteries, tires, and motor oil. Retailers of batteries and oil are required to accept used batteries. The state has a special tire-disposal fund (created in 1984) to promote tire recycling. The Act also promotes state procurement of recycled products.

The state maintains a computerized database of recycling markets. It also provides technical assistance to companies for the reduction of industrial nonhazardous wastes. Grants also are available to fund studies on the application of a previously developed method for waste reduction or to develop new methods.

The Governor's Select Committee on Recycling and the Environment made its recommendations in November 1988. Among those expected to appear in legislative proposals in 1989 are an aggressive waste-reduction program, a goal of 25 percent recycling by 1993, market research grants, loans or grants for recycling businesses, a statewide education program on solid waste, and a permanent household hazardous-waste collection program.

Mississippi

No statewide recycling program exists. A legislative council is considering issues related to hazardous, solid, and infectious wastes that may produce legislation.

Missouri

The state publishes a directory of recycling centers and businesses, but does not provide any direct financial support to recycling. The Department of Natural Resources currently is seeking money from the state Environment Improvement and Energy Resource Authority (an independent agency) to expand the recycling information-clearinghouse function. Solid-waste management plans are required for cities with over 500 residents and more than \$450 million in assessed valuation, and "first-class" counties with 100,000 residents or more plus any municipality within those counties. Amendments to the solid waste law passed in 1986 require state agencies to implement recycling programs and expand state contracts for purchases of recyclables.

Montana

The only recycling programs are run by community-based, voluntary programs; there are no state law or programs related to recycling.

Nebraska

The Litter Reduction and Recycling Act, enacted in 1979, includes a tax on wholesalers and retailers of ten product categories plus wine, beer, and malt beverage containers. Revenue from the tax is distributed as follows: 40-percent for education on litter and waste issues; 20-percent on cleanup; and 40-percent on recycling grants to private and public entities.

Nevada

No statewide recycling program exists.

New Hampshire

A 1988 solid waste management act established state support for recycling and source reduction as waste-management methods. Counties and municipalities are to prepare solid-waste management plans that address recycling. To date, most recycling has been done at the local level or by private businesses. The New Hampshire Resource Recovery Association is a private, nonprofit organization that operates a cooperative marketing system.

State agencies are required to recycle their wastes and are encouraged to buy recycled paper that contains at least 50-percent post-consumer waste. Vendors are required to specify the amount of recycled content on all bids for paper and paper products.

New Jersey

The Voluntary Recycling Act of 1981 established the Tonnage Grant Program that pays counties and municipalities for each ton of waste recycled. The 1981 Act also established a low-interest loan program for businesses to purchase recycling equipment. The Mandatory Source Separation and Recycling Act of 1987 incorporated programs from the 1981 law, but added several new elements.

- Counties are required to submit recycling plans for a minimum 25 percent recycling with mandatory source separation of at least three materials plus leaves, which are banned from landfills.
- County plans must identify explicitly how materials are to be processed and marketed. If no markets exist, no collection is required.
- A 50 percent tax credit for investments in recycling equipment.
- State procurement policies were changed to include recycled products. State purchases of recycled paper must be as follows: 10 percent in 1987; 30 percent in 1988; and 45 percent in 1989 with a 50-percent minimum recycled fiber content. The law also allows up to a 10-percent price preference. State agencies are required to use compost materials in maintenance of public lands and to purchase recycled crumb-rubber asphalt and glass for highway construction projects. Paper products covered include: newspapers, office papers, paper napkins, towels, corrugated cardboard, construction material, toilet tissue, and other paper products containing at least 10 percent noncellulose materials.
- A set-aside of \$8 million in general revenues was allowed to fund market development studies and start-up grants to local recycling projects.
- A Recycling Fund supported by revenues from a surcharge on each ton of waste landfilled was set up. Distributions are as follows: 40 percent for tonnage grants to communities; 35 percent for low-interest loans; 10 percent for statewide education; 8 percent for county program grants; and 7 percent for administrative costs.

New Mexico

No statewide recycling exists. The legislature set up a task force in August 1988 to revise the state's Solid Waste Plan, which had not been updated since the 1970s.

New York

The state mandates a deposit on beverage containers. The legislature is considering ways to recoup a portion of unredeemed deposits from bottlers.

The Solid Waste Management Act of 1988 provides \$26 million for solid-waste activities including:

- a 50-percent matching grant program for the capital costs of recycling equipment, especially "low-tech" equipment such as containers;
- one-time competitive grants for 75 percent of operating costs for recycling programs, such as salaries of coordinators;
- grants for 90 percent of the costs of plan development;
- market development funds of \$3 million for databases, low-interest loans, and other economic development incentives to attract businesses; and
- an appropriation of \$3.5 million for state administrative costs.

The 1988 act also requires solid-waste plans by 1990 from all planning units, including multicounty areas upstate, New York City, and multitown units on Long Island. Plans must address the hierarchy of waste-management methods, aim for 50-percent reduction and recycling by 1992, and have source separation by 1992. Planning units must complete their recycling analyses before permits will be issued for new disposal facilities.

Procurement policies require a minimum of 40 percent secondary-waste content and allow a 10-percent price preference for purchases of recycled products. Recycled paper products purchased by the state must be labeled. State agencies are required to separate wastes. The state also is sponsoring a study of market supply and demand for recyclables.

North Carolina

A legislative commission currently is studying a recycling proposal. The state offers tax preferences for purchases of recycling equipment and for the formation of recycling businesses through the state income tax and the local property tax. The state also runs one of the most aggressive technical assistance programs in the country, "Pollution Prevention Pays." Staff members work with companies that produce solid and hazardous waste to provide information, conduct waste surveys to suggest options for waste reduction, and award matching grants.

North Dakota

The North Dakota Health Department provides technical assistance to communities and businesses if requested and compiles a list of recyclers and processors. The state imposes a surcharge on auto titles that is intended to lower the number of abandoned autos.

Ohio

The state has had a litter-control program, funded by a surcharge on manufacturers and retailers of seven product categories, since 1980. The program includes an effective education program on waste issues.

Comprehensive solid-waste management legislation became effective in mid-1988 that authorizes the director of the Ohio Environmental Protection Agency to levy fees on disposal of solid waste. It requires the director to adopt a state solid-waste management plan and counties to develop their own waste-management plans, or join with other to develop multicounty plans.

Ohio has several grant programs for recycling, including: grants to nonprofit organizations (since 1981); grants to local governments (since 1987); and 50 percent matching grants to businesses (passed in 1988, not effective until 1990). The state also has funded 12 to 15 recycling demonstration projects.

Oklahoma

The Oklahoma Recycling Act requires state agencies to give preference to purchases of recycled paper. State offices must implement paper-recycling programs; revenue from the sale of recovered wastepaper is used to buy recycled products.

Oregon

In 1971 the state enacted the nation's first mandatory bottle deposit law. In 1982 the state enacted the Recycling Opportunity Act, which requires towns with 4,000 or more to make recycling convenient to all residents through curbside collection and conveniently located drop-off depots. Presently, 67 of 69 cities with populations of 4,000 or more and 39 smaller towns participate actively in curbside-recycling programs.

Other statewide recycling initiatives include:

- a 35 percent tax credit, added in 1980 to credits for energy-conservation projects, for investment in recycling equipment;
- a 50 percent tax credit as part of pollution-control program begun in 1973;
- revised transportation rates for backhauling recyclables at lower than posted rates; and
- a procurement program dating from 1975 requires a minimum of 50 percent secondary or 25 percent post-consumer waste content and allows a 5-percent price preference for state purchases of recycled products.

Counties are responsible for fulfilling the provisions of the Recycling Opportunity Act. The staff of the Department of Environmental Quality concentrates on education and promotional efforts including publication of a newsletter, development of grade-school curricula, and publication of a market directory of recycling businesses.

Pennsylvania

The Municipal Waste Planning, Recycling, and Waste Reduction Act of 1988 contains the following requirements. All counties must submit solid-waste management plans by the end of 1990 that contain a detailed analysis of recycling. All communities over 5,000 and densities greater than 300 persons per square mile (approx. 408 communities) must establish mandatory curbside collection for at least three materials plus yardwastes and must also conduct recycling-promotion efforts. Counties over 10,000 must have curbside collection by 1990; communities of 5,000 to 10,000 have until 1991 to start curbside collection. Counties must report annually to the state. The statewide goal is 25 percent recovery by 1997. Commercial, institutional, and municipal establishments must recycle leaf wastes, aluminum, office paper, and corrugate cardboard.

State grants will cover 80 percent of the costs to develop solid-waste plans and 90 percent of the initial costs of establishing recycling programs. Performance grants are awarded based on the type and weight of source-separated materials. Counties will be reimbursed for half the cost of employing a recycling coordinator.

By 1990, landfilling or incinerating yardwaste will be prohibited. The Department of Environmental Regulation (DER) will conduct a comprehensive education program on source reduction and recycling. The agency provides technical assistance to communities and maintains a recycling database. The act also sets up the first statewide recycling program, which includes grants and an education program. The program is funded by a \$2 per ton surcharge on waste that is landfilled or incinerated. A ban is imposed on the disposal of lead-acid batteries. Battery retailers and wholesalers are required to accept used batteries when new ones are purchased.

State agencies are to develop and implement recycling and waste-reduction programs. New market-development initiatives are well covered in the bill. DER will submit reports on market conditions for recyclables and recommend strategies to increase and stabilize markets. DER plans to conduct a source-reduction study to examine product durability, recyclability, packaging tax incentives and disincentives, product prohibitions, performance standards and other reduction mechanisms.

The Department of Transportation is to provide R&D grants for use of recyclables in highway construction and maintenance. The Department of General Services will develop a preferential procurement plan for recycled products that allows a 5-percent price preference, requires that state agencies follow federal procurement guidelines, and allows the preferential use of compost in public-land maintenance. Purchases of recycled paper are to reach 10 percent of total state paper purchases by 1989, 25 percent by 1991, and 40 percent by 1993.

Rhode Island

Recycling began with litter-control grants to municipalities and private organizations to establish or expand programs. The Mandatory Recycling and Source Separation law of 1986 directed that all towns using state-owned disposal facilities--90 percent of the residents--must phase in separation and collection programs by 1991. The state determines the types of materials collected; its goal is to reduce wastes at least 15 percent. Each town determines its own collection methods and costs, although all collection programs include special containers for residents to place recyclables.

Commercial establishments were required to begin separating corrugated cardboard, colored writing paper, newspaper, aluminum, glass, and steel containers as of 1989. The state offers technical assistance to businesses on source reduction and recycling. The Rhode Island Solid Waste Management Corporation (RISWMC) runs one MRF and plans at least two more. It also issues grants to towns to pay for all costs of the first three years of recycling even for towns that are not required to recycle.

Effective in 1989, a \$5 fee is due on all new batteries purchased unless a spent battery is traded in. A retailer cannot refuse to accept a spent battery. The state prohibits purchase or sale of any food service product containing CFCs. It created a commission to produce a plan for recycling plastic and foam food containers and develop guidelines for the use of degradable plastic containers. Legislation enacted in 1988 encourages the use of labels and logos on consumer products to indicate recyclability.

The 1985 Solid Waste law requires 50 percent secondary waste or 25 percent post-consumer waste content for all recycled products bought by the state, with 5-percent price preference. It also requires interagency cooperation for volume purchases of paper and other products that could contain recyclable material.

A Source Reduction Task Force was established in 1986 and includes representatives from industry, public-interest groups, RISWMC, the Department of Environmental Management, and other state agencies. The task force has mounted several source-reduction initiatives including education efforts and promotion of product labeling to indicate environmental impacts. It also has made recommendations on legislation to promote source reduction.

South Carolina

No statewide recycling program exists.

South Dakota

No statewide recycling program exists.

Tennessee

No statewide program for recycling exists other than state permit requirements for some baling and processing facilities. Permit applications for disposal facilities require feasibility studies of alternatives. Solid-waste planning is not required of cities or counties. The state prepared a solid-waste plan several years ago, but has not updated it. The state Department of Health and Environment plans to study recycling.

In 1981 the state prepared a directory of businesses in recycling that lists large manufacturing concerns primarily. There are no state procurement requirements, although a legislative committee is considering some.

Texas

A 1979 law requires the separation, collection, and sale of waste paper generated by state government offices. The law includes a general statement endorsing state procurement of recycled products "if available at reasonable cost."

A law passed in the last session requires that solid-waste plans reflect the state's hierarchy of management methods. However, the law did not include a requirement that plans be done. If a city or county does a plan, the state will pay 50 percent of plan-development costs. But because the law never was funded, no grants were issued. Regional plans exist for the Houston and San Antonio areas, but both were completed before the new law took effect, so they do not address the hierarchy.

The state recycling coordinator responds to questions, but the position is not a full-time responsibility. The legislature's interest in recycling is growing, however; a committee plans to meet between sessions to research solid-waste issues. The state is looking for funding mechanisms and currently is considering a landfill surcharge.

Utah

No statewide recycling program exists.

Vermont

Since early 1980s, the state has mandated deposits on all beverage containers. More recent, the state enacted the Solid Waste Management Act of 1987 that includes grants for 100 percent of the planning costs and 40 percent of the capital costs of recycling facilities, plus a hierarchy of waste-management options. It created set-asides for state procurement of recycled products: 15 percent in 1988; 25 percent in 1990; and 40 percent in 1993. All products are included.

The act also set up a Solid Waste Management Assistance Fund supported by a \$2.40 per cubic yard franchise tax on landfill owners. The fund is used by the Department of Environmental Conservation (DEC) for solid-waste activities such as landfill assessments, recycling promotion-education efforts, research and development, and data collection. DEC recently developed a five-year solid-waste plan that is awaiting approval by the legislature.

Virginia

No statewide recycling exists. In March 1988, the governor signed legislation allowing local governments to mandate source separation. About 12 local governments are involved directly with recycling and another 12 to 15 have recycling conducted by private, nonprofit groups. The state has about 300 private buy-back centers. A joint legislative subcommittee is studying waste reduction and recycling and is expected to report on issue in the next session.

Washington

The Department of Ecology is studying the "best management practices" for all components of the waste stream; a comprehensive report was due by the end of 1988. The staff completed a statewide waste-stream survey and analysis in 1986; however, although its new best management practices report is expected to go considerably beyond the 1986 project. The report is expected to give special attention to plastic debris and other nondegradable materials.

A 1982 law, amended in 1988, requires the state to use a weighting factor--the amount of recycled content in a product--when evaluating purchases. State agencies require that bidder statements specify the percentage of recyclable materials in products. A tire-recycling program provides funds for removal of tires and recycling based on 0.12 percent tax on gross receipts of new tire purchases. The State

Liquor Control Board is not allowed to purchase liquor products for resale in nonrecyclable or nondegradable containers.

The state publishes a market directory of businesses and conducts education programs on waste issues. Under a 1971 litter-control law, the Department of Energy allocates funds for education, litter control, and waste-management research and development. The Office of Waste Reduction provides technical assistance to reduce pollution from both hazardous and solid wastes.

West Virginia

Under comprehensive solid-waste legislation effective in mid-1988, wastesheds and local solid-waste authorities are created for planning and tax purposes. It levies a fee of \$1.25 per ton on wastes disposed of from within a wasteshed and \$2.25 per ton on wastes disposed of from outside a wasteshed. The host county also may add \$0.50 per ton to the fee. The first \$50,000 the fees generate will be used to fund a recycling study by the Department of Natural Resources.

Wisconsin

Municipalities are required to provide residents the opportunity to recycle; however, they are required only to provide for drop-off centers, not curbside collection. Owners and operators of solid-waste disposal sites and transfer stations must provide recycling collection centers unless a sufficient number already exists in the municipality. At a minimum, materials accepted must include newspaper, aluminum, glass, and plastic.

Bills enacted in 1988 include requirements for plastics labeling and state agency separation and collection of waste paper with a target of 50-percent recovery by 1990. A ban on landfilling of yardwastes also took effect. State agencies are to establish a wastepaper-recycling program. The Department of Administration is to review state purchasing to encourage recycling.

Wyoming

No state recycling law exists. The only solid-waste activity the state has undertaken is to revise regulations to comply with new EPA landfill criteria.

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Appendix B

State Case Studies

This appendix examines the recycling programs for four states: Michigan, New Jersey, Oregon, and Rhode Island. These programs reflect a range of options that states can employ to encourage recycling.

The Clean Michigan Fund

In contrast to many states in the northeast, Michigan's most serious solid-waste problems are still several years away. While a few counties face immediate shortages (especially Macomb and Wayne counties), most of the landfills have sufficient capacity for at least five years. Most municipalities continue to enjoy low landfill tipping fees that average \$15 per ton. Under these circumstances, few incentives exist to develop waste-recycling programs in communities or businesses. However, concerns about the environmental impacts of landfilling have motivated state officials to seek ways to reduce dependence on landfills. Recycling is an important part of the state's approach to reduce future landfill needs.

The state's efforts to encourage recycling began in 1983 when the Department of Natural Resources issued its "Solid Waste Strategy." The strategy encouraged counties to adopt an integrated waste-management system that included the following priorities and goals:

Source Reduction	5 percent
Reuse	5 percent
Recycle	25 percent
Compost	6 percent
Incineration	40 percent
Landfill	19 percent

The state did not require that communities conform to these goals but rather encouraged them to adopt a mix of technologies most suited to local needs, characteristics, and preferences. The state Department of Natural Resources (DNR) was responsible for publicizing the goals and working cooperatively with communities to meet or modify the goals as appropriate.

The governor and legislature agreed to allocate \$10 million each year from general revenues to help implement a portion of the strategy. The money was used first in 1985 to establish the Clean Michigan Fund, which gave grants to private businesses, nonprofit organizations, and public entities. The grants were used for a variety of purposes, especially market development for businesses using recyclable materials in their manufacturing processes. Other grants were awarded for the capital and operating costs of recycling-composting programs. In all, 22 recycling and composting projects, including several existing and new curbside-collection programs, received grants of nearly \$2 million.

The fund also supported a variety of studies that helped shape the state's recycling plans. These studies include the following.

Solid Waste Stream Analyses. Samples of wastes from six counties wastes were sorted manually and weighed to determine the composition by material category. The sampling was conducted over several months to determine changes in waste composition over different seasons. Waste samples also

were analyzed for energy content. This study found that yardwastes make up a higher volume of the waste stream than originally thought. As a result, DNR increased its statewide goal for composting.

Recycling-Composting Feasibility Studies. Studies of recycling-composting programs were conducted in 11 communities with various population densities, geographic sizes, and locations within the state. The results indicated that recycling is feasible in every area, although several different approaches would be needed. The study showed that virtually all areas also would benefit from regional processing and transportation centers for recyclable materials.

Statewide Market-Development Studies. The state sponsored a series of market studies for specific materials in the waste stream including: wastepaper, glass containers, metals (aluminum, white goods/appliances, steel containers), plastics, used tires, and used oil. The studies also examined options to overcome barriers to market expansion in Michigan and outlined a strategy to develop recyclable material markets.

Waste-to-Energy Feasibility Studies. A series of waste-to-energy studies was conducted in nine counties and regions. They included a description of energy-recovery technologies, financing alternatives, procurement approaches, project risks and risk management, flow-control issues, economic comparison with landfilling, and an implementation strategy for resource recovery facilities in the state.

In addition to the projects conducted under the Clean Michigan Fund, DNR staff estimated the "true costs" of landfilling to provide a better comparison with other disposal technologies. True costs included post-closure care, loss of revenues from materials that could have been recycled, energy that could have been recovered, or lost production from farm acreage taken for landfills. DNR estimated that true costs run about \$40 to \$50 per ton--three to four times the average landfill tipping fees in the state.

DNR staff found that, compared to incineration, recycling was one-sixth the cost and composting was less than one-twentieth that amount. These comparisons serve as the basis for the state's hierarchical approach to waste management that requires consideration of least-cost methods--source reduction, recycling, and composting--before incineration and landfilling.

The state also has used the Clean Michigan Fund to begin a three-pronged educational effort that includes a campaign to encourage residents to buy products from recycled materials; technology transfer on composting projects; and preparation of generic publicity materials for counties and to use in local promotional efforts.

While these studies were conducted, the state legislature searched for ways to strengthen the solid-waste planning process. Unlike many states, Michigan historically had placed considerable emphasis on solid-waste planning. The first statewide planning requirements date back to the late 1960s when legislation passed that encouraged counties and municipalities over 10,000 to develop solid-waste plans. This requirement was strengthened in 1978 with the passage of Public Act 641 (P.A. 641) that provided state funds for 80 percent of the cost of developing and updating solid-waste plans and made the counties responsible for preparing and implementing the plans. P.A. 641 also provided that before the state would approve a permit for a new disposal facility, the county must have a waste-management plan. Permits for any new disposal facility must be consistent with that plan. Finally, P.A. 641 gave solid-waste management plans priority over local zoning laws. If a facility were included in the solid-waste plan, siting of the facility could not be overridden by local zoning ordinances. Various court actions confirmed the authority of the solid-waste plans. The approved plans essentially function as permits and have been used to control the flow of wastes between counties.

Several proposals have surfaced over the last ten years to revise the solid-waste planning requirements. In January 1988, the legislature finally agreed to changes that explicitly emphasize recycling. Public Act 6 requires each county to evaluate the feasibility of recycling/composting and, if

feasible, develop an implementation plan. For many counties, especially in the more populous areas, the new law effectively requires recycling.

DNR recently updated its statewide solid-waste strategy to reflect Public Act 6. Signed by the governor in May 1988, the Solid Waste Policy (as it is now titled), encourages every community to develop an integrated waste-management system and reemphasizes the hierarchy developed in the 1983 strategy. The goals for source reduction and composting are higher in this version, which reflects the findings of state studies. The other goals are essentially the same, although they are now expressed in ranges rather than single percentages to encourage greater flexibility among local programs. The goals to be implemented by the year 2005 are:

Source Reduction	8 to 12 percent
Reuse	4 to 6 percent
Compost	8 to 12 percent
Recycle	20 to 30 percent
Energy Recovery	35 to 45 percent
Landfill	10 to 20 percent

To implement the new policy, the state recently approved of a \$150-million bond issue for solid-waste alternatives (the \$150 million was part of a larger, \$800-million bond issue known as the Quality of Life Bond). DNR is developing rules for distributing the solid-waste alternatives money. The money probably will be made available to local governments and private entities in grants and low-interest loans for composting and recycling projects, market development (including equipment and facilities for expanding markets for recyclables), household hazardous-waste collection centers, solid-waste education, waste-to-energy projects, research and development of source reduction and market development, and landfill closures.

Incinerators will continue to function to reduce landfill needs; DNR recommends, however, that the state fund no more than 25 percent of the costs of constructing waste-to-energy facilities. DNR also expects to provide full funding of the capital costs associated with community-wide recycling for selected "model communities" throughout the state. The agency intends to use the experiences of these model communities to help overcome general skepticism among local officials and the private sector toward the potential of recycling.

DNR also has endorsed the Solid Waste Policy Implementation Plan which calls for legislation to increase support for the waste-management hierarchy contained in the Solid Waste Policy. The implementation plan recommends the following actions.

- Communities would have to establish an aggressive recycling program before new permits are issued for incinerators.
- Potentially hazardous or "difficult-to-handle" materials would have to be separated from other trash. Landfilling of lead-acid batteries and used oil would be banned and a fee would be imposed on the sale of new tires to pay for cleanup of tire piles and fund private-sector efforts to recycle or reuse them. Battery and tire retailers would be required to accept the used products.
- A disposal fee would be imposed on landfills and incinerators to fund state and local regulatory activities associated with construction and operation of disposal facilities.
- Composting would be encouraged by banning landfilling and burning of yardwastes.
- Labeling of the resin content of plastic containers would be required.

- A Plastics Recycling Council would be formed to identify research and development opportunities for methods of recycling plastics. The council would be a cooperative effort among state government, plastics industries, recycling industries, and the public to identify potential for changes in plastic materials and manufacturing to enhance recycling.
- A packaging surcharge would be placed on materials according to their recyclability or some other measure to reduce unnecessary or environmentally unsound packaging.
- Residents and businesses would be encouraged to change disposal habits by requiring municipalities to adopt volume-based trash collection fees, expanding the state deposit law to include all glass beverage containers, imposing a fee on specific products that contribute to household hazardous waste, and banning the use of nonrecyclable containers when an alternative exists (e.g., egg cartons or grocery bags).

Some of these initiatives were debated but not passed during the 1988 legislative session. Three bills that did pass promote better waste management in state agencies by requiring them to purchase recycled paper and other products and implement wastepaper recycling. Purchases of recycled paper are to be phased-in as follows: 30 percent of total paper purchases in 1989 must contain 25 percent wastepaper; 40 percent of the paper purchases in 1990 must contain 35 percent wastepaper; and 50 percent of total paper purchases in 1991 and thereafter must contain 50 percent wastepaper. Other recycled products to be purchased by state agencies include paper products, plastics, rerefined lubricating oil, reclaimed solvents, asphalt and concrete, glass, tires, and metals. One law allows a 10-percent price preference for purchases of these and any other products, and provides for minimum levels of state purchases of recycled products (minimum levels are set at 10 percent of purchases by 1989, 15 percent by 1990, and 20 percent by 1991 and thereafter).

Under the 1988 Office Paper Recycling Act, DNR is to implement a wastepaper-recycling program among state agencies. The goal of the program is to reach 85 percent recycling by January 2000. Revenue from the sale of wastepaper is to be used to implement the program and reimburse state agencies for expenses.

In December 1988, the governor signed an executive order requiring state agencies to test and demonstrate the usefulness of recycled products including recycled plastics, paper, glass, oil, tires, and newsprint. Among the many demonstration projects included in the order, DNR is to develop a public park whose facilities are to be made from recycled products as much as practicable. The executive order also bans state purchases of food and beverage containers made from CFCs and prohibits new contracts for purchases of nondegradable packaging and colored writing paper.

Unlike some northeastern states pursuing more immediate remedies, Michigan has proceeded methodically to research and study recycling, evaluate alternatives, develop plans and recommendations, and work with the state legislature to adopt new requirements and programs. Rather than mandate recycling, Michigan has sought to provide information and assistance to encourage communities to embrace recycling on their own.

Sources for the Michigan case study include the following official state reports: *Michigan Solid Waste Policy* (Lansing, June 1988); Executive Order 1988-14 (December 1988); *A Report to the Governor from the Recycling Promotion Advisory Committee* (October 1988); Solid Waste Implementation Plan (Draft #5); 1988 legislation on office paper recycling and recycled products procurement; and *Sourcebook of Information Gathered Through Studies* (May 1988). Staff from the Waste Management Division of Michigan Department of Natural Resources also provided information for and comments on this case study.

New Jersey's Market's First Approach

Historically, New Jersey has relied extensively on its counties and municipalities to manage solid waste. The original solid-waste plan prepared by the state in 1976 specified that each county was responsible for collection and disposal of the solid waste generated within their borders.

The state's first legislative effort to support recycling was in response to severe landfill shortages. Existing landfills were running out of capacity--projections were that all but two landfills would be closed by mid-1988. New landfills were impossible to site in a state weary of dealing with some of the country's worst pollution problems. The Voluntary Recycling Act of 1981 expressed the state's support for recycling as a way to conserve landfill space and specified a statewide goal of recycling 25 percent of wastes by 1986. Most significant, the act established grant and loan programs for towns and businesses to undertake recycling projects. They included:

- the Tonnage Grant Program that paid municipalities for each ton of recycled materials;
- grants to counties and municipalities for recycling education and promotional efforts;
- low-interest loans and loan guarantees up to \$300,000 to businesses for purchases of land, buildings, equipment; and
- six percent sales-tax exemptions on the purchase of recycling equipment.

The grants and loans awarded were important in helping counties, municipalities, and businesses finance recycling projects. From 1982 to 1987, municipalities received over \$21 million to support recycling programs and counties received almost \$3.5 million; together they produced an estimated 13-percent reduction in waste-disposal needs statewide. Towns and counties used grants for a variety of purposes. For example, a \$200,000 grant helped Camden County finance construction of an intermediate processing facility that processes and markets 80 tons per day of recyclable cans and bottles. Since opening in late 1985, the facility has saved participating townships approximately \$1 million each year in landfill costs. Private businesses also benefited by the state's low interest loans for purchases of recycling equipment. According to state officials, 12 business-recycling loans totaling close to \$3 million were awarded in the first three years of the program.

Rising disposal costs also were compelling counties to search for alternatives. In one year alone, disposal costs for some counties increased by as much as 800 percent. Several events contributed to the rise in tipping fees.

Landfill shortages increased the amounts of trash transported out of state. By 1987, over 40 percent of New Jersey's solid waste was shipped to other states. (In contrast, just five years earlier, New Jersey had been a net *importer* of wastes from Pennsylvania and New York.) Meanwhile, tipping fees in the receiving states, primarily Ohio and Pennsylvania, were skyrocketing. In some states a surcharge was added for out-of-state wastes. Out-of-state tipping fees (*not* including costs of transportation) rose as high as \$137 per ton from previous levels of \$9 to \$10 per ton. Other states also were searching for ways to prohibit in-coming trash legally, increasing the pressure on New Jersey to find landfill alternatives.

Tipping fees at landfills in the state also rose, although more gradually than out-of-state rates. The state Board of Public Utilities, which regulates tipping fees, has gradually raised rates to cover the increasing costs of land and compliance with environmental regulations. By 1987, in-state tipping fees averaged over \$50 per ton.

The combination of the state grants programs, landfill shortages, and the rising costs of disposal proved to be powerful and effective incentives to counties to develop recycling programs. In 1982, approximately 200,000 tons of wastes were recovered; by 1986 those amounts increased five-fold to over

1.1 million tons. By 1986, 440 of New Jersey's 567 municipalities (over 75 percent) had some form of recycling that resulted in a 13 percent decrease in waste-disposal needs statewide. Over 150 towns mandated source separation of at least one material. After experiencing some initial success with recycling, local officials looked for ways to divert even greater amounts from the landfills. However, they believed that political difficulties would limit more rigorous, mandatory source separation at the local level. These officials began to work with the state Department of Environmental Protection to enact a statewide recycling program.

In 1987, the state legislature enacted the Mandatory Source Separation and Recycling Act. While the new law has been lauded for starting the most comprehensive statewide recycling program, it endured two years of often heated debate, which began in January 1985 when the governor first proposed the idea as part of his State of the State address. Some of the most vocal opposition came from the recycling industry which feared that the program would seriously disrupt existing private recycling efforts. They were concerned that state involvement in recycling (they referred to it as "welfarizing" the recycling business) would displace an existing network of small private dealers, buy-back centers, and charitable organizations, such as the Boy Scouts, that were already involved in collecting and selling recyclable materials. Recycling industry groups predicted that greater supplies of post-consumer recyclables would create a glut in the market causing prices for materials to fall, forcing existing dealers and organizations out of business. They claimed that mandatory source separation would undermine, rather than encourage, efforts to divert wastes destined for the landfill. Garden State Paper, one of the largest users of wastepaper, predicted that as the government entered the business of recycling, the quality of the processed materials would suffer.

In response to some of this criticism, the legislature revised the original proposals. The final legislation, as enacted, contains some important new provisions for market development and, more significant, does not force local governments to collect what they cannot sell. The New Jersey Mandatory Source Separation and Recycling Act stipulates that all counties are required to work with their municipalities to prepare recycling plans that describe the county's method of collection, processing, and marketing of materials. They must designate at least three materials other than leaves (which were already banned from landfills) to be separated at the source. Facilities for leaf composting must be designated. Each municipality must determine targets so that at least 25 percent is recovered county-wide (excluding leaves).

Each county or municipality within the county must have a signed contract or agreement for processing and marketing materials before they are required to collect the materials. In this way, recyclables are defined by available markets and can change as the markets change. The state may exempt counties for one year if they are unable to locate a market for a material.

To create and stimulate demand, the act continued the low-interest loans that existed under previous voluntary recycling program. Corporate tax credits of up to 50 percent were added by the 1987 act for purchases of new recycling equipment, which also are exempt from state sales taxes. The law also created a state market by establishing goals for state purchases of recycled materials. By fiscal 1990, 45 percent of state paper purchases must be of recycled material. The law allows for a price preference of up to 10 percent for recycled paper and paper products. State agencies also are required to use composted materials in the maintenance of public lands and to purchase recycled asphalt, rubber, and glass for highway-construction projects. By contributing to the demand for the recycled products, the state hopes to provide an additional incentive to businesses to manufacture the products.

DEP also is responsible for examining ways to increase recycling for materials with historically low recovery rates, including plastic and bimetal beverage containers. If these types of containers do not reach the same recycling rates as glass and aluminum, DEP is to make specific recommendations to improve recovery rates. DEP also funds research on recycling of ash from resource-recovery facilities and the composting of grass clippings with leaves.

The new law also set aside \$8 million from general revenues for counties and municipalities to develop plans and begin to implement recycling programs. It authorized \$200,000 of the \$8 million for market studies that the state will use to determine other market-development needs. The law also established a recycling fund with a surcharge on wastes disposed at approved facilities. This surcharge of \$1.50 per ton has generated approximately \$12 million each year. The act specifies that 40 percent of the fund is to go to municipalities and counties as part of the continued Tonnage Grant Program, 35 percent goes to low-interest loans to businesses and grants for market development and research activities, 10 percent goes for education, 8 percent for county program grants, and 7 percent for state administrative costs. The amount of each tonnage grant is based on an annual report from jurisdictions on the amount of materials recovered each year. This annual report also serves as state's primary method to track the progress of the recycling efforts.

DEP's Division of Solid Waste established a separate Office of Recycling to implement the new program. The office reviews county recycling plans, provides technical assistance to communities, and administers the low-interest loans, tax credits, and the tonnage grant program. An important responsibility of the office is development of education programs. The current campaign--"Sort It Out Before You Set It Out"--encourages households to separate their trash. The Office of Recycling also has produced public service announcements and billboard and transit advertisements that promote public participation in the recycling program. The office also has several programs targeting grade school students. One presents Mr. R.E. Cycle, a magician, who appears at schools and children's events.

The amount of materials recycled statewide in the first year of the program are not yet available. However, the town of Montclair, which has had a recycling program since 1971, has reported a 22-percent increase over 1986 in total tons of waste recycled. The addition of composting of yardwastes, which was begun in 1987, brought the town's total reduction in disposal needs to 29 percent--almost double the rate of 1986. The recycling program received approximately \$100,000 in subsidies (including \$60,000 from the town, \$7,200 in the state tonnage grant for 1986, and \$35,700 from the state's one-time allocation), but realized net benefits over \$700,000 when lower landfill costs are included.

Questions remain about how markets will respond to this new program: whether all counties will be able to secure sufficient markets to recycle 25 percent of their wastes; whether the state procurement provisions will encourage greater production; and whether businesses will use the tax credit to initiate or expand investments in recycling equipment. With 7.5 million people, New Jersey is the largest state to undertake a recycling program. It will provide important lessons for other government-run recycling programs.

Sources for the New Jersey case study include the following state documents: *Recycling in Review: An Update on Eighteen Months of Mandatory Recycling in New Jersey* (Trenton, 1988) and *New Jersey Statewide Mandatory Source Separation and Recycling Act Summary* (September 1987). Data on recycling results for Montclair were provided by Montclair Recycling. Staff from the Office of Recycling of the New Jersey Department of Environmental Protection also provided information for and comments on this case study.

Oregon's Recycling Opportunities

Unlike many of the states that face solid-waste problems, Oregon's recycling program evolved in response to market needs and demands plus public interest rather than a legislative mandate. Recycling initiatives developed because they were economically attractive to private businesses and the public was more than willing to participate. State initiatives followed these public and business interests and are intended to enhance and publicize the environmental and economic advantages of recycling.

Oregon has recycled for decades, but its efforts gained national attention in 1971 with the enactment of the nation's first mandatory bottle-deposit bill. Intended as a litter control effort, the

legislation imposed a 5-cent deposit on beverage containers. Redeemed containers were then returned to bottlers for reuse, recycle, or disposal. For the first time, manufacturers had to take responsibility for products after their useful life.

The bottle bill helped to spark residents' interest in other recycling opportunities. At that time, a private group called the Oregon Recycling Information and Organization Network (ORION) was helping private, individual recycling efforts by linking suppliers to markets for their recyclable materials. In 1973, the state took over that role and established the Recycling Information Office within the Department of Environmental Quality (DEQ).

Oregon was better suited for recycling than most states. Even in the early 1970s, markets for recyclables such as glass, corrugated cardboard, and newspaper already were available within the state. In addition, weather conditions in the Northwest led to energy shortages before the rest of the country experienced them with the 1974 OPEC oil embargo. Many manufacturers turned to using recyclables in place of other virgin materials to cut energy consumption.

A network of dealers developed in the 1970s to meet this growing demand for recyclables. Some dealers were associated with specific waste-collection businesses, but others operated independently. The dealers would purchase materials from local haulers or recycling centers (in some cases dealers operated the centers) and then sell them to manufacturing companies. The dealers profited from selling materials for more than the cost of collecting, processing, and marketing them. The state estimated in 1982 that over 200 operators dealt with residential and commercial recyclable materials.

A series of state-sponsored economic incentives encouraged even more private efforts. In 1973 an existing tax credit for pollution-control facilities was expanded to include recycling and resource-recovery facilities. The credit, administered by DEQ, offered a 50 percent credit against corporate taxes to be taken at 5 percent per year for ten years. In 1980, the state added a separate 35 percent energy-conservation tax credit that included purchases of recycling equipment. The energy tax-credit program, administered by the Oregon Department of Energy (ODOE), has awarded some of its largest credits to recycling projects. By 1982, ODOE had spent over \$20 million on recycling projects. The state legislature also exempted recyclables from the transportation rate structure to allow trucks and trains returning from the eastern part of the state to backhaul recyclables at lower-than-posted rates.

The national economic recession of the early 1980s, however, caused recycling profits to decline and in some cases, disappear. Demand for materials of all kinds, including secondary materials, dropped as sales of finished goods decreased. Many independent recycling dealers closed down. The economic downturn especially affected the small dealers who were either just getting started or were barely covering costs before the downturn.

Despite the recession, recycling remained part of Oregon's economic and social fabric. In 1982 37 manufacturing industries relied on wastepaper, scrap metal, used glass, old corrugated cardboard, and used plastics and tires as raw materials. Four composting facilities also remained in operation in the state. Oregonians recycled roughly 55 percent of their newspaper and cardboard, over 80 percent of the beverage containers, and roughly 20 percent of other glass containers. At the end of 1982, 75 landfills in the state had ongoing salvage operations to remove recyclables from the trash and sell the materials to dealers. Also by 1982, 14 cities had curbside collection of recyclables. Realizing that existing markets could absorb greater supplies, agency staff contemplated various forms of source separation and curbside-collection programs to make recycling even more widely available.

The history and practice of trash collection within the state, however, made a mandatory source-separation program difficult. Private haulers regulated by local government franchises collected almost all the state's trash. Many towns had more than one hauler. DEQ officials believed that a source-separation program would not work without an incentive to ensure that residents separate their trash. With trash haulers competing for customers, few would encourage them to separate trash at the source because they might lose business.

Rather than mandate source separation, the state studied various voluntary programs to get more residents and businesses to separate recyclables from their trash. Based on a statewide survey, the state concluded that more residents would separate their wastes voluntarily if collection were more convenient. Previously, residents took recyclables to designated recycling centers. In response, the state legislature passed the Oregon Recycling Opportunity Act in 1983 which specifies that everyone in the state must have the *opportunity* to recycle. The law mandates convenience by requiring monthly curbside collection of recyclables in towns with populations of 4,000 or more. In addition, all disposal sites must have a drop-off center for recyclables or designate a more convenient location for their collection. Communities also are required to conduct education and promotion programs to encourage public participation. If the state determines that recycling rates are not sufficient, it reserves the authority to mandate source separation.

Under the new law, the state established wastesheds, defined as "an area of the state having a common solid waste disposal system." Wasteshed boundaries followed county lines except for the three cities of Portland, West Linn, and Milton-Freewater. Wasteshed administrators were responsible for preparing a report on how they intended to provide for curbside collection. The law also defined recyclable material as "any material or group of materials which can be collected and sold for recycling at a net cost equal to or less than the cost of collection and disposal of the same materials."

The government's role in the program is primarily oversight. Most local governments simply require the private haulers to offer collection of recyclables as part of their regular collection service. As a result, separation and collection practices vary widely among the cities and even within a city. For example, some haulers require use of special containers, others require residents and businesses to prepare materials differently. In some cities with more than one trash collection company, even residents along the same street may have different programs.

The state helps coordinate markets by working with local governments and businesses to match demand with supplies. DEQ runs workshops with each of the wastesheds and published a market directory of recycling businesses. It also promotes source separation by supporting local educational and promotional efforts and publishes a newsletter that serves as a clearinghouse for educational ideas and activities. DEQ recently developed a recycling course curriculum for elementary and high school students.

Oregon boasts some of the highest rates of recycling in the country. As much as 22 percent of its wastes are recycled rather than landfilled or incinerated. Seventy cities were required by law to have curbside collection, but as of January 1987, 104 cities offered monthly residential recycling collection services. Many even offer weekly collection. Nearly 75 percent (approximately 2 million) of Oregon's 2.66 million population live in areas where curbside collection of recyclables is available.

The impact of curbside collection on participation by residents and businesses has been moderate. Two years into the program it appears that residents inclined to separate their trash voluntarily were already doing so before the law went into effect. The centralized depots have not had much of an impact on participation either. According to DEQ, residents who haul their own trash simply take recyclables to the recycling center at the landfill and do not make a special trip to a more conveniently located depot. However, more aggressive education efforts and a growing awareness of general solid-waste problems are resulting in higher participation rates.

In a state with high corporate tax rates, the tax-credit programs have proven especially effective in expanding the market for recyclables. According to a recent state survey of 56 recycling businesses, nearly one-half of those surveyed claimed that they would not have been able to afford recycling equipment without the tax credit. Many more businesses stated that the credit allowed them to make larger investments and to make them sooner. The survey also found that "equipment purchases certified for the tax credit have helped to increase materials recovery, employment, and business viability.

Substantial savings have been achieved in the costs of waste disposal, transportation, process energy, and space."

Oregon has benefited from its proximity to the resource-hungry Asian markets. As the dollar has dropped relative to foreign currencies, Asian demand for wastepaper, scrap metals, and other recyclables has helped to keep material prices high. Good prices guarantee that dealers continue to collect and process materials. Exporting the materials, however, lowers the supply for domestic markets, which have been strong in Oregon. As a result, recycling industries in Oregon must now import materials from as far away as Colorado.

A variety of factors made recycling a "natural" in Oregon. General environmental awareness among residents created the supply of materials. Most important, however, strong private-sector markets have been the mainstay of recycling and have made a large-state role unnecessary. Recycled materials, however, are vulnerable to changes in supply or demand. For example, a drop in foreign demand because of a rise in the value of the dollar could result in lower prices and greater supplies of materials. While such a situation may mean that recycling businesses are able to get cheap materials, dealers would realize lower profits. A similar situation could occur if California, which has ten times the population of Oregon, institutes recycling without an accompanying market expansion. An economic downturn also could adversely affect recycling as it did in the early 1980s. Less demand for final products could mean that recyclables are landfilled or burned rather than converted for use.

Sources for the Oregon case study included the following state reports: *Oregon's Recycling Opportunity Act: Report on Implementation to the 1987 Oregon Legislative Assembly* (Portland, January 1987); *Recycling in the 80s: Moving into the Mainstream, 1982 Annual Report of Solid Waste Division* (June 1983); and *Survey of Recycling Investments Certified for Tax Credits* (January 1988). Staff from the Hazardous and Solid Waste Division of the Oregon Department of Environmental Quality also provided information for and comments on this case study.

Rhode Island's Mandatory Recycling

Rhode Island's experience in solid-waste management is similar to the experience of some large cities and counties. Because of the size of its population and land area, the state's history of involvement in solid-waste management differs from that of most states. Initially the state became involved beyond the environmental regulation stage in 1974 when the legislature established the Rhode Island Solid Waste Management Corporation (RISWMC). Its first goal was to plan and develop resource recovery facilities, primarily energy-recovery facilities that were especially attractive during the energy-crisis years of the mid- to late 1970s. However, the RISWMC's efforts to site an incinerator were repeatedly derailed by local opposition.

In 1980, the state became more directly involved in the operation of solid-waste facilities when the RISWMC purchased the Central Landfill, by far the largest landfill in New England handling 4,000 tons of trash per day. The closing of three active landfills in 1984 increased local dependence on the Central Landfill, which now receives 90 percent of the wastes generated in Rhode Island. State subsidies of tipping fees meant that communities continued to enjoy low-cost disposal, giving them little incentive to undertake programs to reduce disposal needs.

In 1985, RISWMC approached the legislature with plans to obtain flow-control authority for a large, 1,500 tons per day (TPD) incinerator. To obtain the necessary bond rating to finance the project, RISWMC had to guarantee that the incinerator would receive the necessary 1,500 TPD of wastes. Flow-control legislation introduced in the state legislature would have given RISWMC the authority to divert wastes to ensure minimum tonnage for the incinerator. The legislation, which did not include any provision for recycling, was voted down in large part because of opposition from environmental and community groups.

In the meantime, the state Department of Environmental Management (DEM) was beginning implementation of the litter control law passed in 1984 as a substitute for the bottle bills that many New England states were enacting to reduce litter. This law required a 5-cent tax on each case of beer and soda to pay for a litter-control program operated by DEM. Almost as an afterthought, the legislature included recycling as part of the bill.

Using its newly granted authority, DEM established a new division, known as Ocean State Cleanup and Recycling (OSCAR), to operate an aggressive program to promote recycling. Using funds generated by the litter tax, OSCAR began a grants program, awarding over \$250,000 to municipalities, nonprofit agencies, and private recycling companies to establish or expand recycling programs and capabilities. DEM also contracted with Brown University to analyze the economic aspects of recycling including the costs of collection, the interaction between public and private sectors, market fluctuations, and the need to produce a large volume of high-quality materials. The study verified that recycling was the least-cost method of disposal when avoided landfill costs were considered. This study was finished in the summer of 1986, about the same time the legislature reconsidered flow-control legislation for a RISWMC-sponsored energy-recovery facility.

The release of the final recycling report fueled the debate on alternatives to large energy-recovery facilities. RISWMC had so far been unsuccessful in getting one approved at either the local or state level. The outcome of the debate on resource recovery was a major new law, referred to as the Flow Control Law of 1986, that establishes an integrated solid-waste management system. The law ranks waste-management options sequentially as follows: reduction, recycling, energy recovery, and landfilling. It sets the goal for recycling at a minimum of 15 percent. The law significantly scaled down the size of the first energy-recovery facility but required development of two smaller facilities. It also ordered that recycling facilities be built at or near all state-owned disposal facilities. The most significant provision of the new law mandated that only source-separated trash would be accepted at state-owned facilities. Because they handle 90 percent of the waste generated in the state, this law effectively made towns separate trash before disposal.

The new law gives DEM and RISWMC responsibilities in implementing the new program. Acknowledging the role that DEM had played in recycling, the new law assigned DEM to work with communities to develop recycling plans. RISWMC provides funds to DEM for this purpose. RISWMC, which historically had not been involved in recycling, was assigned to run all state disposal facilities and provide financial assistance to offset the additional costs to towns of collecting recyclables for a three-year period. RISWMC also owns the recycling facilities that process materials collected in the municipal programs.

With this new mandate, DEM focused on developing the regulations and plans for the recycling program. DEM staff researched all aspects of recycling programs from newspaper to plastics. Because few U.S. cities and no states had comprehensive recycling efforts underway, DEM looked to Canada for information on how to design an effective recycling program. The state hired consultants to help shape their plan. Based on their research, DEM developed a master plan and promulgated regulations that spelled out in detail how the recycling program would work at the local level. The program includes the following components.

Phase-in of local source separation programs. Source-separation programs were phased in at specified municipalities starting in 1988. By 1990, all 39 cities and towns using state-owned disposal facilities (representing approximately 1 million people) are required to recycle at least 15 percent of their trash. Towns that had operating landfills as of December 1986 are encouraged, but not required, to start recycling programs.

Statewide definition of recyclable materials. State regulations define recyclable materials based on available technologies, economic conditions, waste-stream characteristics, and environmental effects. The initial list of recyclables included glass containers, newspapers, ferrous metal cans, aluminum, and white

goods (appliances). The state has sponsored studies of specific, hard-to-dispose materials (tires and plastics) to determine whether to add them to the definition of recyclables. As a result of these studies, certain types of plastics, specifically the HDPE and PET plastics used in milk jugs and soda bottles, are to be included in the definition of recyclables.

Special containers for households. To ensure participation rates high, household separation of trash has been kept simple. Residents must separate waste into three categories: nonrecyclables, newspaper, and recyclables (glass and metal food and beverage containers, aluminum and plastic soda bottles, and plastic milk jugs). All of the recyclables are placed together (or commingled) in special containers (referred to as "blue boxes") that are provided by RISWMC and are collected the same day as regular trash pick-up.

Assistance in developing recycling plans. Although the state determines the types of materials to be collected, each town is required to have a plan detailing equipment and staffing needs and costs for their trash-separation program. The law requires RISWMC to offset additional collection costs incurred by a community for the first three years. DEM provides technical assistance to towns in planning and implementation of separation programs.

Support to public education efforts. DEM provides technical assistance to towns for education programs to inform the public about recycling and encourage households to separate their trash. Education efforts must begin at least two months before a town must separate trash and include news media coverage, public meetings, and other publicity events. In addition, the "blue boxes" are shipped to households in advance along with information brochures about the separation program. DEM also has developed a recycling curriculum to be used in public schools.

Processing and marketing of recyclables. RISWMC will construct material-recovery facilities (MRF) at all state-owned landfills and resource-recovery facility sites. These facilities can receive large quantities of recyclable materials (the contents of the "blue boxes") and process these materials to meet market needs. The first MRF opened in late 1988 and processes--separates, bales, or crushes--60 TPD of newspaper and 80 TPD of commingled bottles and cans. There is no charge for recyclables brought to the MRF, which will accept recyclables for the entire state until two additional MRFs are built.

RISWMC will own all three MRFs but they will be privately operated. The first MRF is operated by New England CRInc., a private company paid by the RISWMC at a rate of \$23 per ton to separate, process, and market the recyclable materials. New England CRInc. is responsible for working with industry and end-users to identify market needs and ensure that materials recovered at the MRF are processed to meet those needs. Revenues generated from the sale of secondary materials are apportioned between New England CRInc. and the RISWMC.

Market development through state procurement requirements. To help build the market demand for recyclables, state agencies are required to buy recycled products whenever possible. The law defines recycled paper as including a minimum of 50 percent secondary waste or 25 percent post-consumer waste content and allows up to a 5-percent price preference for state purchases of recycled paper.

Subsidized tipping fees for separated trash. The state also is proceeding with plans to construct two energy-recovery facilities, although they will be much smaller in scale than RISWMC originally planned (limited to 750 TPD). Each will include an MRF on site. Tipping fees at these facilities and the large, state-owned Central Landfill would be subsidized for source-separated municipal trash. Tipping fees for separated trash currently are \$10 per ton. Nonseparated trash would be charged the same rate as commercial waste, which is close to five times higher at \$49 per ton.

As the master plan was developed, DEM started to work with the first nine communities scheduled to undertake recycling. DEM developed preliminary recycling plans for these towns and held a series of meetings with town representatives to review the plans. Rather than focus on the preliminary plans, however, the towns' residents and officials raised other concerns about the program. Town officials

wanted assurance that the state would provide enough funds to cover the planning and implementation costs. They also were skeptical of whether a program run successfully in Canada would be effective in Rhode Island.

After many meetings, DEM worked out a series of compromises. The state agreed to give grants to local governments through RISWMC that would cover all "reasonable costs" of recycling for their first three years, even in towns with their own landfills. "Reasonable costs" were defined to include equipment (compartmentalized trucks and special trash containers for each household), education, salaries of truck operators, and administration (including wages for recycling coordinators).

To quell concerns about the effectiveness of the recycling program, DEM agreed to conduct a pilot program to "test" the model adapted from the Canadian experience. Two towns--East Greenwich and West Warwick--were selected for the pilot programs that ran from October 1987 to May 1988. The results compiled to date indicate that participation rates and waste diversions exceeded original expectations. Monthly participation in both towns was consistently above 80 percent, with 4,500 households taking part. The towns estimate the reduced volume of their waste at 484 tons, roughly 14 percent of the waste stream. At the nonsubsidized disposal rate of \$49 per ton, this amounts to about \$1,000 per week lower disposal costs.

In addition to helping resolve concerns about the effectiveness of the state recycling plan, the pilot programs provided information that the state used to "field test" and improve the overall program. The pilot programs experimented with plastics collection, evaluated the effectiveness of the public-education efforts, determined the feasibility of curbside collection of two boxes, and assessed the efficiency of truck operation and the effect on the cost of regular trash collection.

Starting in January 1989, commercial establishments are required to separate and market their wastes. RISWMC provides assistance to private companies in developing markets for commercially generated recyclables and publishes a directory of industries that purchase recyclables. As a last resort, companies that are unable to locate a market for their recyclable materials may bring the materials to the MRF.

Recycling, however, like any other solid-waste management option, is not free. The state estimates that it will spend over \$30 million over the next six years for recycling, including construction of the first MRF. The net costs of collection, transportation, and processing probably will run to \$7.50 per person each year. Collecting and hauling the materials to the MRF, at \$100 per ton, is the costliest element of the program.

Despite these costs, the state has found that recycling is the least expensive solid-waste management option for materials with stable markets. Once revenue from the sale of materials is included, the net costs of curbside recycling, including processing and marketing, are projected to be less than \$50 per ton. Total costs of landfilling and incineration are expected to be much higher, especially when collection, transportation, and disposal costs are included. Recycling also gets cheaper as more people recycle. Recycling expenses rest mostly on the relatively fixed costs of equipment and new staff. Once these costs are covered, additional recycling reduces the net cost per ton.

Sources for the Rhode Island case study included the following state documents: *Annual Costs and Benefits of Recycling: Curbside Recycling is a "Least-Cost" Solid Waste Management Option* (staff paper, Providence, R.I., 1988) and *Waste War II: Strategies and Tactics in the Ocean State* (June 1988). Staff from Rhode Island Solid Waste Management Corporation, Department of Environmental Management, and New England CRInc. also provided information for this case study. State staff also reviewed this study.

Northeast-Midwest Institute

The Northeast-Midwest Institute, the Center for Regional Policy, is a nonprofit research and public education organization dedicated to the long-term economic vitality of the northeastern and midwestern states. It conducts research, develops public policies, provides technical assistance, sponsors regional conferences, and distributes publications.

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